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Enterprise Service

Special Issue

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Holding Fast to Our Aspirations as We Prepare for the Future



By Sun Maolu, President of the Enterprise Technical Service Dept of Enterprise BG

Huawei only exists to create value for customers. With the rapid development of information communications technology (ICT), the digital landscape of the third platform featuring technologies such as cloud computing, big data, artificial intelligence (AI), and Internet of things (IoT) is gradually taking shape. Digital services centered on intelligent platforms and tools will reshape the sharing economy. This rapid development of the ICT industry is leading to disruptive change, during which only the bold pioneers will become the future leaders in the ICT industry. Huawei Enterprise BG is committed to becoming the preferred digital transformation partner for customers who are developing future-oriented strategies.

Over the years, Huawei Enterprise BG has always striven to build a strong ecosystem that has leading platforms and advanced technologies. It has focused on industries such as safe city, finance, energy, transportation, and manufacturing. We are also developing an ICT talent chain to provide customers with ubiquitous service experiences.

So far, Huawei Enterprise BG has built three Global Service Centers (GSCs), one each in Romania, Mexico, and China, providing 24/7 services in 17 languages. These GSCs have introduced new technologies such as big data intelligent analysis, intelligent scheduling, and augmented reality (AR), leading to improved operational efficiency by 20%. In 2017, one of the GSCs received the Technology Services Industry Association (TSIA) Support Staff Excellence Center designation.

Huawei Enterprise BG, continuously invests in innovation and seeks to pioneer new technologies and scenarios. It has invested a total of US\$ 500 million over five years. In addition, we work with partners to build three industry systems that involve industry cloud enablement services, industry solution services, and industry operation and maintenance (O&M) services. We have also built an enterprise cloud tool platform that helps improve end-to-end service capabilities in areas such as planning and design, integration implementation, customer support, intelligent O&M, and performance improvement.

Huawei's industry cloud enablement services have provided

cloud transformation services including cloud consulting, cloud assessment, cloud planning and design, cloud migration, cloud disaster recovery, and big data planning and design for over 1,000 customers in industries such as finance, government, and manufacturing. These services have helped customers shorten their service provisioning time, improve their IT resource utilization by up to 50%, and reduce their total costs of ownership by up to 40%.

Huawei's industry solution services cover industries such as public safety, finance, energy, and transportation. Huawei's safe city service solutions have been deployed in more than 700 cities in more than 100 countries and regions. Huawei's digital banking service solutions have been put into commercial use in more than 300 financial institutions, including 20 of the world's top 50 banks. Huawei's energy solutions have been widely used by more than 190 electric power industry customers worldwide. Huawei's transportation solutions have served over 230,000 km of railways and highways, over 70 urban railway lines, and more than 60 airlines.

Huawei's industry O&M services have been widely applied in nine industries, including government, public utilities, transportation, energy, and finance, providing high-quality service experiences for more than 400 customers.

Every industry is undergoing digital transformation, and ICT talent is now a key resource that ICT companies are competing for. Huawei is making continuous efforts to build a new talent chain for the digital era, and it is developing an integrated technical certification system that covers domains such as cloud computing and big data. It is also developing an ICT industry certification system that covers industries such as public safety and finance. By doing so, we hope to guide product and technical specialists to become high-end ICT talent. In order to build a model for the future talent development, Huawei has cooperated with 600 universities and colleges worldwide. So far it has employed 1,200 certified trainers, that are training 45,000 graduates every year.

In Huawei Enterprise BG we adhere to the value proposition of "Smart Services, Experience the Future". We are committed to safeguarding our customers' digital transformation and contributing to a fully connected, intelligent world.

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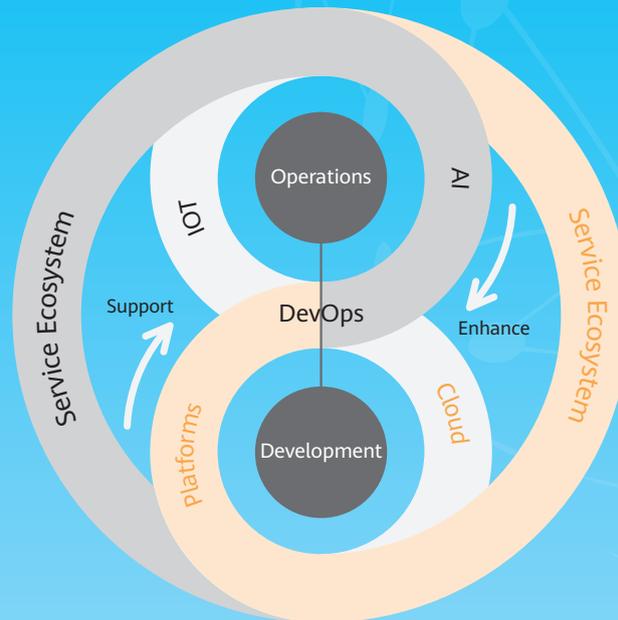
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Service Development and Operations in the Future

By Zhao Zhisong, Senior Strategic Planning Manager of Huawei Enterprise Services

Technology develops with the times, and technological innovations are changing the world.





Steam power ushered in the first industrial revolution. This era saw machine-based manufacturing gradually replace much manual labor. The second industrial revolution was characterized by the wide application of electrical power. This marked the beginning of the age of electricity. The third industrial revolution was ushered in at the end of the twentieth century. It was brought about by the rise of computers and information technology (IT) that led to automated production. Today, a fourth industrial revolution, which builds upon the third industrial revolution, is underway. Technologies such as artificial intelligence (AI), cloud computing, big data, Internet of things (IoT), and 5G are changing the future. We will enter an intelligent world where all things can sense, all things are connected, and all things are intelligent.

Trends such as digital transformation, intelligent automation, and cloud-first strategies are profoundly impacting the development of IT services. Traditional face-to-face services will gradually be supplanted by "machine-to-machine" services, which are increasingly intelligent and cloud based.

Service Development in the Future: More Inclusive Cloud and Platforms

Digital transformation is gathering momentum. IDC forecasts that worldwide spending on digital transformation in 2019 will reach US\$1.7 trillion, an increase of 42% compared with 2017. Not only are cloud technologies the

basis of digital transformation, they are also becoming the key to the digital transformation of enterprises. Many companies are developing their cloud-first strategies into cloud-only strategies. Over the next decade, more and more industries and enterprises will grow with the cloud. Cloud technologies will be a basic requirement in various industries and enterprises. It is projected that by 2025, all enterprise IT solutions will have been migrated to the cloud and more than 85% of enterprise applications will be deployed on cloud.

In addition, the "hybrid cloud+IT" heterogeneous network environment consisting of public cloud, private cloud, and traditional IT architecture are becoming increasingly complex. Various industry applications using technologies such as IoT, AI, and SaaS are growing exponentially. Industry ecosystems involving inter- and cross-industry service synergy and innovation are expanding. It is increasingly difficult for traditional management methods used in fields such as operations and maintenance (O&M), development, and security to meet emerging requirements. Therefore, at present, digital platforms are becoming the core factor that supports digital transformation and operation. Some enterprises (such as GE, which specially developed the Predix Platform for the manufacturing industry) prefer to build themselves into platform-based enterprises that provide services for different industries. Some enterprises (such as Huawei, which developed an industry enablement platform) prefer to leverage their technical capabilities to build open, flexible, and safe ICT infrastructure platforms.

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Service Development and Operations in the Future

This allows customers to focus on the advantages of optimization and service innovation, without having to struggle with complex ICT hardware and software systems at the lower layer. Building digital platforms helps to build healthy industry ecosystems, and it facilitates the sustainable development of the entire industry. This is achieved by nurturing industry partners and providing them with open and shared resources.

There is a saying in the ancient Chinese classic, *The Book of Changes*, that goes "As earth's condition is receptive devotion, a gentleman should hold the outer world with a broad mind." Only increasingly inclusive clouds and platforms can support a thriving intelligent society in the future. In response to the increasingly inclusive cloud and platforms, the future IT service providers will need to build advantages in domains such as cloud planning and design, cloud application migration, cloud security, cloud-based O&M, and industrial

digital platform services, in order to help industry's customers to expedite their digital transformation.

Service Operations in the Future: Increasingly Intelligent Services Powered by AI and IoT

ICT infrastructure, consisting of broadband, cloud, IoT, and big data, is one of the foundations of the intelligent world. With the development of AI technologies, ICT infrastructure powered by AI is gradually transformed from a support system to a production system and even into a decision-making system. There are many new growth opportunities for ICT infrastructure. According to the Huawei Global Connectivity Index (GCI), between now and 2025 when AI is fully developed and widely applied, ICT infrastructure will produce \$23 trillion in new economic benefits. With the development of intelligent industry systems and service

applications, services including customer services, automatic network deployment, network fault prediction, automatic processing, and automatic analysis are progressively becoming intelligent and more dependent on technologies. AI technologies reduce an enterprises' dependence on their labor force, improve service predictability and reliability, and reduce delivery costs. Until 2021, service providers with intelligent automation capabilities will be able to reduce their delivery costs by 15% to 25% annually. One of the most obvious examples is that AI is increasingly applied in the main user interfaces (UIs) of more and more applications and services. According to IDC, 30% of enterprises will interact with customers using dialog-based voice technologies. By 2024, UIs and automated processes that support AI technologies will have replaced one third of the current screen-based applications.

As another component of the intelligent world, IoT will not only facilitate



connections between people, but also connections between things. This will dramatically increase the number of connections. As of 2015, there were already 16 billion connections and this figure is estimated to reach 100 billion by 2025. In the near future, a world where all things are connected will become a reality. As cloud infrastructure, enterprise applications, and services are applied to terminals (sensors, phones, cameras, and so on) and to the edges of data sources, the coverage of digitalization will undergo a large scale expansion. The large number of terminals, connections, and requirements for edge computing poses great challenges to an enterprises' IoT O&M and intelligent automation capabilities. Therefore, there is an urgent need for IoT platforms with comprehensive analytical capabilities, security and management service solutions, and terminals with intelligent automation capabilities such as self-adaptation, self-deployment, and self-optimization. IDC predicts that in 2021, about US\$1 trillion, or

85% of enterprise IoT project investments, will go towards new technology development. In addition, from 2018 to 2021, at least US\$3.1 billion of IT consulting services and US\$11.2 billion of system integration services are expected to be used to build and implement IoT solutions.

Enterprise services, industry applications, and physical connections are becoming more and more intelligent. Future IT service providers must develop the capabilities to adapt to industry digital scenarios (including smart city, smart campus, safe city, finance, transportation, energy, and electricity), digitalized and integrated service applications, managed O&M, the operations of the massive connections, and intelligent digital platforms that have been built to support the further expansion of intelligent automation.

Conclusion

Emerging technologies such as AI, cloud

computing, and IoT are facilitating industry digital transformation. This trend drives enterprises to transform from infrastructure-based to service-based, from hardware-based to software-based, and from traditional business models to an intelligence-based platform economy. In addition, hardware products generally designed for almost every industry are posing challenges to the transformation of industry-specific services.

Based on years of experience in the ICT industry, Huawei Enterprise Service has developed industry cloud enablement services for enterprises and designed industry solution services for industry scenarios. Moreover, Huawei Enterprise Service has established the cloud-based digital intelligent platform called ServiceTurbo Cloud, and built a massive ecosystem by cooperating with industry partners, in order to help industry customers to achieve digital transformation and continuous business monetization.



"As heaven maintains vigor through movements, a gentleman should constantly strive for self-improvement." Time waits for no one. We continue to develop ourselves and move with the times!

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Addressing the ICT Talent Shortage and Providing Support for the Digital Transformation



Innovative technologies such as artificial intelligence (AI), big data, cloud computing and Internet of things (IoT) in the information communications technology (ICT) area have become an important engine for driving the digital transformation of the social economy, and it is facilitating the growth of the ICT industry. However, opportunities usually come with challenges, and this holds true for the ICT's development and for the industrial digital transformation. One challenge is the huge deficit of ICT talent. Addressing the talent shortage has become a major challenge facing the industry. >>

Addressing the ICT Talent Shortage and Providing Support for the Digital Transformation

By Li Jisheng, Director of Brand Communication, Huawei Talent Ecosystem Development Dept



In the coming two to three decades, technological progress will bring us into an intelligent world, where all things sense, all things are connected, and all things are intelligent. GIV 2025: Unfolding the Industry Blueprint of an Intelligent World, a white paper released by Huawei, forecasts that by 2025 there will be 40 billion AI-enabled personal smart devices, 90% of which will have an intelligent personal assistant. 12% of homes will have robots under their roofs. 100 billion connections will help to drive digital transformation in domains including public utilities, transportation, manufacturing, healthcare, agriculture, and finance. In this intelligent world we will see 180 billion TBs of data generated. 85% of enterprise applications will be on the cloud, 86% of global companies will adopt AI, and data utilization rates will skyrocket to 80%. This means that the new yearly generated data will become a constant source of innovative intelligence and value creation.

The Growth of the ICT Industry Stimulates the Growing Demand for Talent

As a knowledge-intensive industry, ICT depends heavily on talent resources, and the flourishing ICT ecosystem is further increasing this demand for talent. Based on the analysis of the industry's talent demand structure, Huawei believes there are three major challenges facing the supply and distribution of talent in the ICT industry.

There is a huge gap between the overall supply and demand of talent. According to statistics from China's National Bureau of Statistics and Ministry of Education, the ICT industry showed that 7.65 million educated professionals were needed in 2017, however the number of ICT graduates entering the workforce per year has not

yet exceeded 1 million. There is a huge gap between the supply of talent and the demand for talent, and the rapid development of the ICT industry is set to further widen this gap. The overall talent deficit is projected to rise to 12.46 million by 2020.

There is a mismatch between talent quality and interdisciplinary industry demand. As the ICT industry develops, the supply chain segmentation continues to reshape the structural demand for talent. Instead of professionals who specialize in a single area, various types of ICT talent with diverse skill sets are needed. ICT companies are no longer satisfied with employees who can complete a task that may appear within a single skillset. They are looking for talent with comprehensive knowledge across multiple domains such as technology, product, marketing, business, and collaboration. However, there is currently a shortage of versatile talent who combine application capabilities, innovative competence, and an awareness of the importance of ICT.

The industry's demand for talent is concentrated in emerging segments. The development of the ICT industry is obviously guided by advanced companies from which other companies learn the technical experience they need to develop. The successful application of other emerging technology demonstrates the potential of the ICT industry in facilitating its growth. In the future, the majority of the industry's demand for talent is expected to concentrate in emerging segments such as cloud computing, big data, IoT, and AI. Meanwhile, companies will have increasingly stringent requirements in terms of technical competence, application skills, and overall capabilities. According to the China ICT Talent Ecosystem Whitepaper, in the cloud computing segment, enterprises prefer employees who can

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Addressing the ICT Talent Shortage and Providing Support for the Digital Transformation

provide users with consulting and guidance on achieving the cloud deployment. In the big data segment, the most sought after skillset is a combination of data analysis capabilities and an understanding of business. In the IoT sector, employees must be able to apply their integrated knowledge systems to a variety of situations. In the AI segment, leading talents who can foster in-depth integration across the ICT industry are key to the industry's success. This is due to the fact that AI technology is now in the breakthrough stage for scenario-based application.

Facing these challenges, how can we set a comprehensive ICT talent development standard to accelerate the training of the talent that is in urgent demand throughout the ICT industry? How can we develop ICT talent better able to meet the demands of the industry's development?

Huawei Launches a New Certification Architecture and ICT Talent Development Standard

Huawei, based on years of experience fostering ICT talent and following the

"platform + AI + ecosystem" strategy, has put forward an ICT talent development standard, featuring cloud-pipe-device synergy that is in alignment with Huawei's new ICT infrastructure. By leveraging years of practical experience and exploratory research in ICT talent certification, Huawei has restructured its former certification architecture to better align with the current level of ICT technologies and enterprises' ICT talent systems. The updated architecture is the only certification system in the industry to cover all ICT technical fields, including ICT Infrastructure Certification, Platform and Service Certification, and ICT Vertical Certification. This provides a more readily applicable, scientific basis for ICT talent development, and better accommodates to the rising demand for this talent in the industry.

Dedication to fostering innovative interdisciplinary talent

Huawei believes that digital transformation in the new ICT era is impossible to achieve with any single technology. Cloud technology relies on the connection of devices, while the value of data generated

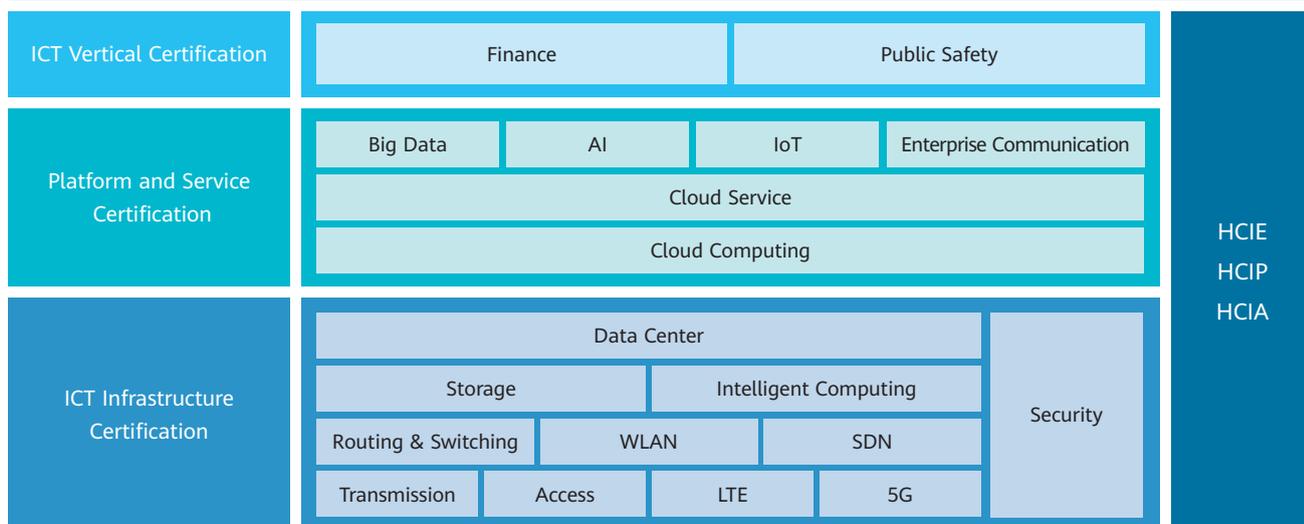
from connected devices relies on processing on the cloud. The synergy of cloud and devices is realized through network connections. Over the past several decades of practice and innovation, Huawei has developed a strong capability for realizing "cloud-pipe-device" synergy. Based on this experience, Huawei will enable ICT talent to meet industry demands for innovation and interdisciplinary skillsets in the coming era.

Three types of certification, each focusing on a different role

According to various positions and demands, the Huawei ICT Infrastructure Certification, Platform and Service Certification, and ICT Vertical Certification provide enterprises with multi-level talent development solutions regarding ICT infrastructure, the establishment of IT cloud platforms, the development of applications, and insight into the industrial application of ICT technologies.

ICT Infrastructure Certification focuses on developing ICT infrastructure professionals. Today, digital platforms are gradually becoming the core infrastructure for production systems in companies. Services

Huawei Certification



are the main driving force behind ICT demand, and in turn, ICT infrastructure is one of the key factors shaping corporate business. The Huawei ICT Infrastructure Certification, with a focus on skills concerning basic ICT software and hardware, aims to foster talents with basic capabilities in planning, construction, and maintenance of ICT infrastructure.

The Platform and Service Certification focuses on the development of professionals who can build cloud platforms and deploy services. As open and shared resources become more common and relevant in the new ICT era, the application of open infrastructures and cloud platforms will become a must for all enterprises. The Huawei Platform and Service Certification, with a focus on cloud technologies and cloud service deployment, aims to foster talents capable of integrating businesses, technologies, and applications. Further, in addition to being able to build and operate cloud platforms and architectures, they will be able to develop new technical applications based on cloud platforms.

The ICT Vertical Certification focuses on developing ICT experts. ICT technologies are increasingly applied in a wide variety of industries. Some ICT practitioners have even raised the concern that ICT talent without

interdisciplinary skills and knowledge are likely to end up without employment prospects. With this in mind, developing an all-round knowledge of both the ICT industry and ICT technologies is in the best way to stand out in the labor market. The Huawei ICT Vertical Certification highlights the typical applications and best practices for industry cognition and ICT infrastructure in vertical industries. It aims to help experienced technical professionals develop capabilities for innovation and interdisciplinary integration, turning them into ICT experts with an in-depth understanding of both technology and business.

Offering certification in new technical directions, closely following trends in technological development

As mentioned above, the majority of industry demand for ICT talent is concentrated in emerging segments. Over the past two years, by following the technological development trends and the growing demand for talent, Huawei has begun to offer certification that is focused in technical directions including cloud computing, cloud service, big data, IoT

and AI. Based on industry demand, these certifications are designed to closely match emerging requirements for ICT talent. Specifically, the Huawei Cloud Computing Certification aims to foster talent capable of building cloud infrastructure and platforms, addressing enterprises' shortage of cloud-building talent. The training, with a focus on Huawei's cloud products and solutions, uses mainstream cloud technologies such as OpenStack and containers to help trainees obtain the skills and knowledge needed in the planning, design, development, maintenance, and troubleshooting of cloud computing. Huawei Cloud Service Certification aims to foster DevOps engineers who can meet enterprises' demand for talent in cloud service deployment. Once they complete the training, they will have a solid grasp of state-of-the-art public cloud technologies, and will be able to use Huawei's software to develop cloud services. The Huawei Big Data Certification aims to foster talent capable of building, developing, operating and maintaining big data platforms. Following training, they will have a working knowledge system of current, mainstream big data technologies and will possess the competence needed to solve industrial problems through their big data expertise. IoT Certification aims to foster talent capable of secondary development through their basic knowledge of Huawei's IoT solutions. AI Certification aims to foster professionals who understand the basic theories of AI and can apply mainstream AI architectures to the development of innovative applications.

Based on this comprehensive talent development standard, Huawei hopes to work with a range of entities including partners, education management authorities and institutions, to build a positive, open, and cooperative ICT talent ecosystem. By 2023, Huawei expects to create a pool of over 700,000 trained professionals for the ICT industry. Doing so will reduce the talent deficit facing the ICT industry, facilitate the digital transformation of industries, and contribute to the steady and continuous development of ICT.





White Paper Introduction

The Business Potential of Industry Clouds Is Realized with Cloud Professional Services

By Gard Little, Vice President, Global Services Markets and Trends, IDC

Chu Xinjun, Senior Strategic Planning Manager of Huawei Enterprise Services and Member of the Technology Services Industry Association (TSIA)

Market Trends

While much has been written about the customer shift to a cloud delivery model and the emergence of industry-specific clouds, it is also important to focus on the three trends that are driving the current state of the market:

- » Customers consistently rank discrete cloud professional services, which helps to create a more efficient business by lowering costs.
- » Customer acceptance of the hybrid cloud approach for IT operations is increasing.
- » Establishing an appropriate high-quality team has become a crucial factor for a successful cloud professional services project.

In IDC's 2018 survey of enterprises implementing digital transformation, over 52% indicated a hybrid cloud approach was their dominant delivery model, compared with just over 14% in 2015. Service providers are responding to this trend by creating increasingly sophisticated delivery models that integrate or arrange multiple cloud services for their customers. For example, Huawei provided an e-commerce client with a hybrid cloud solution that supports improved flexibility. During idle periods, the applications run on Huawei's private cloud. However, during peak periods, the customer can apply for resources from Huawei's public cloud, providing the ability to cope with the surging service demand. Huawei's hybrid cloud approach can incorporate other public cloud services too, if required by the customer.

The cloud ecosystem is becoming increasingly complex. There are more members and types of players. As a result customers are looking for professional service providers who can help manage that complexity. How can new players in the cloud ecosystem benefit customers? Beyond using standard application programming interfaces (APIs) for cloud service interconnectivity, service providers are using their innovation/research and development (R&D) capabilities, venture capital business units, or both to expand their options for sensing and responding to customers.

Leading service providers have created cloud platforms that integrate multiple cloud services that simplify implementation and ongoing operations, although the components of these platforms vary according to each provider's strategy. Platforms can better arrange multiple cloud services through standardization and creation of meta-data about the operations of the cloud services. The meta-data can be used to manage consumption of the cloud services, and to plan for the implementation of

subsequent improvements. Interestingly, the planning, designing, building, and deployment of cloud services also clarifies the way of cloud service operations. New service requirements, technical updates to cloud services, or revision of external regulations will lead to changes in cloud service deployment. Service providers should operate cloud services on behalf of customers to gain better insights into these subsequent deployment changes. The following figure illustrates Huawei's cloud enablement service architecture, which covers the end-to-end lifecycle of services related to implementation and operations.

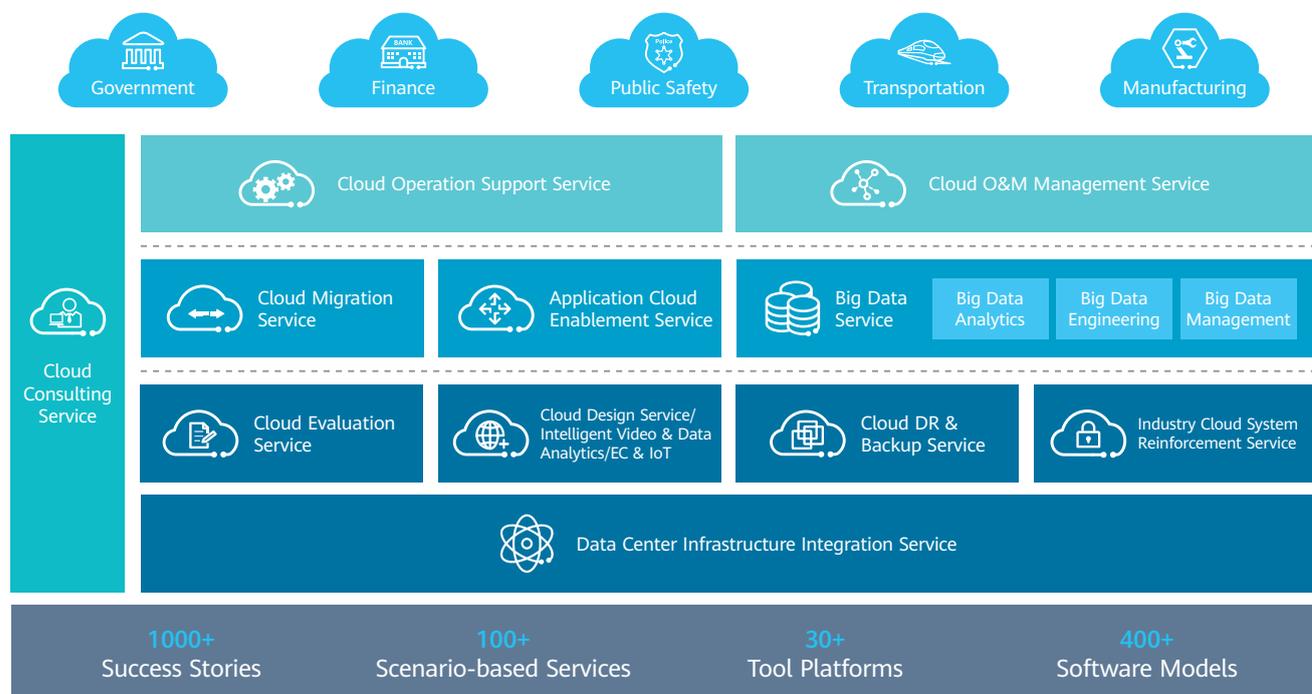
public safety, finance, and high-tech manufacturing industries. By the end of December 2017, Huawei has had over 2,900 global Certified Service Partners (CSPs), including 3 with multi-national service capabilities, 34 with solution service capabilities. More than 129 CSPs have been rated as 5-star. All of the solution service partners and 5-star CSPs have the capability to implement multi-cloud solutions.

Conclusion

End-to-end services for cloud solutions will grow in importance to meet the need for implementing cloud applications and infrastructure, cloud migration, and cloud operations. There will also be steady demand for service providers with industry knowledge, industry-specific cloud offerings, and a breadth of technology services from consulting to management. Since Huawei meets all the preceding requirements, it is positioned to achieve great success, as long as it can help customers address the challenges described in this white paper.

Challenges and Opportunities

In order to help even more types of customers to fully realize business value through industry cloud deployment, Huawei must develop beyond the telecommunications industry and continue to seek knowledge from other industries, either directly, through projects, or via strategic partners. Huawei is doing this to expand its experience in government,



Huawei Cloud Enablement Service Architecture

Huawei Enterprise Service: New Propositions for Digital Operations and Equipment for Enterprise Cloudification

By Wu Yunchuan, CloudTechTime



According to the "Guide to Promoting Enterprise Cloudification (2018-2020)" released by China's Ministry of Industry and Information Technology (MIIT), by 2020, China will optimize enterprise cloud environments and significantly improve industry awareness and enthusiasm for cloudification. Significant increases will be seen in the proportion of cloud-based applications. Cloud computing will be widely adopted in enterprise production, operations, and management. A million new enterprises migrate to the cloud, and more than 100 benchmark application cases will emerge.

From the "Three-year Action Plan for Cloud Computing Development (2017-2019)" last year to the "Guide to Promoting Enterprise Cloudification" this year, the Chinese government has been vigorously encouraging enterprises to accelerate digital and intelligent transformation through the use of cloud computing. However, migrating enterprises to the cloud is just the beginning. As the IDC pointed out in its whitepaper "Unleashing Business Value with Cloud Professional Services", transformation does not cease upon cloudification. Once an organization has migrated to the cloud, the digital process continues.

"Life on the cloud is far from static, and it is possible that organizations underestimate the effort required to introduce cloud-based software and manage those constant changes," the IDC pointed out. Their white paper also emphasized the importance of digital operations and O&M. At HUAWEI CONNECT 2018, Huawei's Enterprise Technical Service Dept released the unified O&M platform I•MOC, incorporating Huawei's vast experience in digital operations. The I•MOC is an external version of Huawei's internal IT tool SmartIT, which allows all enterprises to share Huawei's digital operational experience.

Huawei enterprise service: A driver for digital enterprise transformation

Based on customer O&M transformation requirements and years of industry service experience, Huawei leverages new technologies such as big data and AI, and works with partners to help enterprises develop platform-based, automated, and intelligent O&M service solutions, such as cloud DC O&M, remote management, subscription-based optimization, and smart maintenance. Furthermore, Huawei targets key industries such as government and finance, and provides cloud O&M service solutions covering IT infrastructure and typical scenario applications such as the smart cities, smart campuses, safe cities, and finance/government cloud big data. These solutions help customers reduce fault rates by over 70% and shorten time to market (TTM) of new services by 50%.

Sun Maolu, President of Huawei Enterprise BG's Enterprise Technical Service Dept, reiterated at last year's Huawei Service Forum Huawei's principle of "staying customer-centric and promoting the spirit of craftsmanship." Customer satisfaction is the starting point of Huawei's services. Over the past few years, Huawei has gradually established itself as a trustworthy and innovative industry leader, and has set up a global technical support and self-service platform to provide high-quality services anytime, anywhere. As of 2017, more than 45,000 customers in over 170 countries have chosen Huawei as their strategic transformation partner, including 211 of the world's top 500 companies. These customers are mainly multinational companies in industries such as automotive, banking, electric power, and logistics. Huawei services are now serving more than a third of the world's population.



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Huawei Enterprise Service: New Propositions for Digital Operations and Equipment for Enterprise Cloudification

Zhou Yilin, director of Huawei's Enterprise Technical Service Dept's Cloud Enablement Service Division, shared how Huawei enterprise services can help customers implement digital O&M transformation in the smart era. He said that Huawei provides a full-scenario O&M service solution to help customers better manage and use the cloud.

Huawei's Enterprise Technical Service Dept has established technical support and resource sharing centers in the Asia Pacific, Latin America, Europe, Middle East & Africa, and Russia, which are available in 20+ languages. In addition, Huawei has introduced AI technologies such as big data intelligent analysis, knowledge graphing, natural language processing (NLP), and deep learning to improve work efficiency by 20% and reduce accident rates by 15%. Huawei is also the first in the industry to pass TSIA certification in 2017, making it one of the few companies in the world to obtain such a certification. In the same year, Huawei's technical support website was awarded "one of the top 10 technical support websites" in the world, with more than 1.2 million registered users and 70,000 daily online users. 80% of technical problems

are solved via the online support platform.

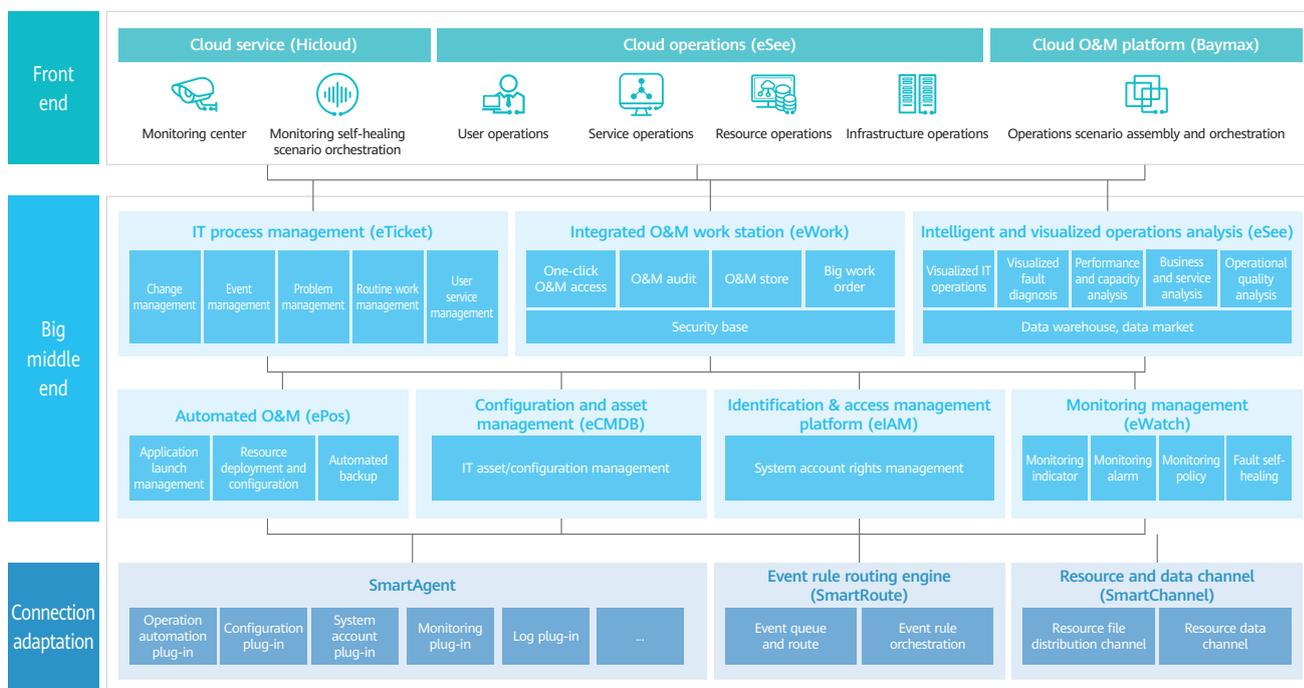
Huawei has established multiple integration verification labs for professional services in seven countries, covering 50+ scenarios. These labs provide full-process verification services covering development, delivery and maintenance. The innovative industry cloud enablement solution eliminates the service and IT gap based on the idea of "business O&M" and provides customers with full-lifecycle services, such as cloud planning and design, migration, and cloud O&M. The solution has been successfully deployed in more than 5000 projects worldwide.

External output of Huawei's digital operations practices

The digital operations experience of Huawei Enterprise Service comes from Huawei's own digital transformation. As one of the world's largest high-tech companies, Huawei faced similar challenges encountered by other medium- and large-sized enterprises in the process of cloudification and digital transformation of its IT systems.

Zhang Peng, Director of the Huawei Cloud Data Center Management Dept, said that with the rapid development of Huawei's global business, Huawei IT is facing growing challenges. Huawei's revenues exceeded CNY600 billion in 2017. Huawei's business spans the enterprise, carrier, consumer, and cloud businesses. Huawei boasts a total of 20 operational centers in 170 countries, and also has 15 R&D centers and 36 joint innovation centers around the globe. The company has 180,000 employees, 60,000 partners and 900 offices around the world.

Huawei started digital transformation of data center management in 2016. By building a standard, visualized, automated, and self-service smart IT management platform, Huawei provides full-stack services including monitoring, management, control, marketing, and support. In fact, in the early stages, Huawei was also a small "workshop" in terms of IT operations. Each service system was operated and maintained independently, lacking unified processes and system support. With the global development of Huawei's business, the number of Huawei users is increasing. This requires that data center services



always be online. Since 2014, Huawei has been investing more than US\$10 million each year in building an internal IT O&M platform, which has achieved remarkable results. Huawei's global resource utilization has been improved nearly threefold. The performance of more than 800 applications has improved significantly, with app response time reduced from 10 seconds to 3 seconds, improving the global user efficiency threefold.

Huawei IT now operates 200+ data centers, 300,000+ servers, 1000 PB+ of data, millions of VMs, 800+ services, and multiple heterogeneous cloud environments around the world. Through Smart IT featuring monitoring, management, control, operations, and support, Huawei IT can achieve the goal of a human-machine maintenance ratio of 1-8000 while ensuring zero interruption of core services. By implementing O&M standards, standardizing expertise, and leveraging AIOps to realize machine-based O&M, O&M personnel can finally "carry out network O&M over a cup of coffee".

At HUAWEI CONNECT 2018, Huawei

officially released the marketable version of the O&M platform based on Smart IT - The unified I•MOC O&M platform. I•MOC supports local deployment and cloud service mode, and is a unified O&M platform across hybrid clouds. I•MOC provides a comprehensive, visualized, and intelligent O&M management system that integrates monitoring, management, control, operations, and support for digital transformation and cloudification of enterprises. The I•MOC's excellent performance can help solve O&M problems found in large-scale cloud architecture, and implement 10 million-level object monitoring (monitoring), 10 billion-level relationship management (management), 1 million-level automatic task scheduling (control), an extremely fine-grained measurement system (marketing), and a standardized O&M management process (support). Based on the I•MOC, services such as ITO, RMS, cloud DC O&M, safe city O&M, and joint O&M can be offered externally.

The unified I•MOC O&M platform brings a new digital O&M experience featuring visualization, intelligence, ease of use, and

openness. In terms of visualization, I•MOC provides six operations themes and a global measurement system, giving users perfect understanding of massive resources and supporting capillary-level visualization. In terms of intelligence, I•MOC standardizes expertise and enables machines to operate and maintain each other, achieving a secure and efficient intelligent platform. In terms of ease-of-use, I•MOC has built-in all-domain standards and supports fast orchestration of O&M scenarios, simplifying digital O&M. Specifically, I•MOC has 20+ built-in standards and supports customized services by dragging. In terms of openness, Huawei utilizes micro-service architecture, integrates ecosystem solutions, and works with partners with open architecture to provide comprehensive IT digital O&M solutions, covering safe cities, smart cities, big data policing, and smart campus.

From Smart IT to I•MOC, Huawei has been sharing its digital operations practices externally on a massive scale, which also demonstrates the evolutionary trend of network O&M --- from manual O&M to automated O&M to intelligent O&M. In the manual O&M era, manual and



Huawei releases the I•MOC platform



Li Peiwang, Deputy General Manager of the Network Operation Dept, China International Electronic Commerce Center

standard IT O&M management tools, especially standard O&M software tools based on the ITSM methodology, were used. Typical examples of this era were HP's OpenView and IBM's Tivoli. In the automated O&M era, IT system scale has increased greatly. Especially after the DevOps model became popular, O&M became more reliant on automatic O&M scripts triggered by events. Typical open source products include Ansible, Puppet, and Chef. In the intelligent O&M era, big data analysis and deep learning are used to enable machines to automatically analyze faults and compile solutions. Splunk is a typical example. I•MOC is a more comprehensive O&M management platform for all scenarios. It supports monitoring, management, control, operations, support, and local and cloud deployment modes and better meet enterprise users' requirements.

Digital transformation: O&M

Li Peiwang, deputy general manager of China International E-Commerce Center's (CIECC) Network Operations Dept, said at HUAWEI CONNECT 2018 that with advanced cloud infrastructure platforms, the construction of the PaaS big data platform and the rollout of SaaS application services, the China's Ministry of Commerce's (MIC) unified business system platform is becoming increasingly advanced. However, with the expansion of service scale and digital

transformation in government, the O&M of MIC's unified platform faced many challenges, especially in service cloudification.

The unified platform O&M faces the challenges of unified management, including centralized monitoring and management of three data centers in two cities, unified management of heterogeneous platform resources, unified access, monitoring, management of devices from multiple vendors, and domain-based self-management and self-service of multiple tenants. The cloudification of MIC's traditional applications faces the problem of system reconstruction, as there was a strong logical association between applications, which had large amounts of data interactions. Cloudification is a complex, systematic project, which requires careful preparation, planning and step-by-step implementation, especially considering the major challenge of secure O&M.

Based on the dual platforms of operations and maintenance, MIC's data center can implement centralized monitoring and unified management of multiple centers, vendors, and users, and multi-tenant self-management by area and domain. In terms of unified management, the unified user authentication platform is deployed based on Huawei's unified network management platform --- eSight, and the MIC unified business system platform. The unified user authentication platform provides unified

authentication, unified portals, service halls, account management, and information interfaces. The unified platform has become the operations management center of the MIC's unified business system platform. In terms of O&M, a unified O&M management platform with CMDB as the core was built. The platform provides centralized monitoring, alarm, and configuration management for the DC equipment room power and environment, network, server, storage, cloud platform, operating system, database, middleware, and upper-layer applications. The unified platform has become the operations management center of the MIC's unified business system platform.

The cooperation between CIECC and Huawei has been deepening: With Huawei's big data services, including planning and design, development support, and management services, CIECC has established five big data platforms and a unified resource library, developed an indicator system, sorted data resources, and gradually interconnected multiple data platforms. Huawei cloud migration services enable the rollout and unified

management of CIECC's 100 service systems. In addition, mutual cooperation has extended to areas such as cloud O&M, cloud security, and cloud talent cultivation. CIECC has achieved centralized O&M of business centers, 24/7 platform security and stable operations. The skills of its O&M team have also been greatly improved.

Looking into the future, cooperation between CIECC and Huawei will enter a new phase in the following aspects:

- » Developing more complete cloud O&M regulations and processes, formulating and optimizing O&M regulations, and developing flexible and customizable service processes.
- » Building an intelligent O&M system in the cloud era to reduce costs and improve efficiency.
- » Constructing big data operations to support visualized and refined operations management and continuously improve CIECC's services.



With the launch of the unified I·MOC O&M platform, I·MOC will become a standard solution for enterprises wishing to migrate to the cloud, thereby facilitating and accelerating their digital transformation.

Huawei Industry Cloud Enablement Services: Addressing Challenges in Cloud Transformation

By Zheng Kai, PPtech

Cloud computing has been developing for more than a decade. Over this time, the cloud computing market has witnessed two major changes:

- » After 10 years of cloud-based practices, cloud services gradually evolved from a concept to reality. Governments and enterprises no longer have doubts about cloud technologies, and have shifted their focus to finding a faster, better, and safer cloud implementation methods.
- » The trend of enterprise cloudification will change the current cloud computing world. Technology companies that mainly provide enterprise-level cloud services are expected to play a leading role in the next stage of cloud computing development.

These two major changes indicate that enterprise cloudification will become the core service of the entire cloud computing market during the cloud computing 2.0 era.



Challenges in Enterprise Cloud Transformation

Enterprise cloudification enables enterprises to quickly enter the market by reducing operational costs and improving efficiency. However, Rome was not built in a day. Enterprises still have a long way to go before they can fully implement cloud transformation and ultimately reap the benefits from the enterprise cloudification.

A number of research institutes have summarized various types of challenges in enterprise cloudification. According to CSO, a security consultancy, there are four major challenges for enterprises who wish to migrate services to the cloud:

Compliance: Enterprises in some specific industries are concerned about the compliance of enterprise cloud services, because the regulatory policies on cloud services are unclear. However, as the implementation of industry clouds is gradually standardized, this concern about compliance will be resolved.

Security: Security has always been the major concern of enterprise decision makers. This is why enterprise customers have avoided using public clouds in the past. They were worried about security issues such as data security caused by lack of data sovereignty, and potential for data loss in the event of a system breakdown.

Costs: Many industry cloud systems are plagued by redundant projects. In addition, most enterprises do not have sufficient technical capabilities to manage these projects, which further results in operation and maintenance (O&M) costs. These high costs increase the difficulty of cloudification for enterprises.

Complexity and compatibility: Most enterprise application systems have experienced several years of construction. Their service software and data are usually designed based on the traditional architecture. However, cloudification will bring about significant changes to the

enterprise service architecture. How to ensure compatibility between the new and old architecture? How to smoothly migrate the systems to the cloud? These problems make the cloudification process complex, time-consuming, labor-intensive, and technically difficult.

Take an e-Government cloud project from Province X in China as an example. The cloudification solution had to address the old system problems such as the high costs caused by redundant projects, low resource utilization, scattered resources, difficult management, aging equipment, and frequent faults. In addition, new problems had to be considered. For instance, how can institutions break through the current government resource barriers to achieve data convergence and sharing? How can they realize data value and drive service innovation? Across various industries, when customers are motivated by the benefits of cloud technologies to implement cloud transformation, most of

them will also encounter the preceding problems and challenges.

As we can see, enterprise cloudification is not simply data center construction, but a systematic project that involves the optimized construction, proper use, and comprehensive management of the cloud. In other words, enterprises' cloudification solutions have to be designed based on the entire lifecycle.

Huawei's 10 Roles Throughout the Lifecycle of Enterprise Cloudification

On June 12, 2018, Huawei launched its Industry Cloud Enablement Services at CEBIT 2018 in Hanover, Germany. Zhou Yilin, Director of the Cloud Enablement Service Dept, Huawei Enterprise BG said: "In order to realize the shift from infrastructure-based O&M to application-based O&M, enterprises must take the right path to the cloud with comprehensive end-to-end professional cloud enablement services."



In the middle: Sun Maolu (President of Enterprise Technical Service, Huawei Enterprise BG)

On the left: Ye Zhonghua (Director of the Enterprise Business Professional Service Dept., Huawei Enterprise BG)

On the right: Zhou Yilin (Director of the Cloud Enablement Service Dept., Huawei Enterprise BG)



Huawei Industry Cloud Enablement Services provide a wide range of services that cover the entire lifecycle of industry cloud transformation, including cloud consulting, cloud assessment, cloud planning and design, cloud implementation, cloud migration, cloud disaster recovery and backup, cloud security, cloud O&M, big data planning and design, big data development and support, and big data management.

Cloud consulting, cloud assessment, and cloud planning and design focuses on the requirements analysis and consulting services at the early stage, to ensure the optimized construction of the cloud. Cloud implementation, cloud migration, cloud disaster recovery and backup, and cloud security focuses on the optimized construction of the cloud. Cloud O&M focuses on the comprehensive management of the cloud. Big data planning and design, big data development and support, and big data management focuses on the proper use of the cloud.

At each stage of the lifecycle, Huawei plays a different role.

For example, at the early requirements analysis stage, Huawei is a consultant for customers' cloud strategies, an analyst for customers' cloudification processes, and an architect of customers' cloud platforms.

At the cloud construction stage, Huawei acts as a porter, migrating customers' services to the cloud; as a first responder, handling emergencies for customers' services on the cloud; and a guardian for customers' services on the cloud.

At the cloud management and O&M stage, Huawei is a watchman for customers' service operations on the cloud, an architect of customers' data platforms, a designer for customers' data service development, and a manager of customers' data systems.

In my opinion, these 10 roles are created based on Huawei's extensive accumulated experience in industry cloud enablement projects. Huawei's success is not a mystery. It has been achieved by constant practical innovations that meet customers' needs.



Huawei Data Center Integration Service: Making the Construction of Data Centers Quick and Cost-Effective

By Shang Jigang

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Data is indispensable, it is like a fuel for the digital economy, and data centers are like the engine that unleashes the energy contained in the data. Now that cloud computing has been fully extended to the edge, data centers play a more important role in determining the application experience and the level of service quality. People are constantly exploring greener and more energy-efficient engines. IT professionals are exploring more environmentally friendly ways to reshape data centers, such as with shorter construction periods and providing higher economic benefits. The data center integration services provide a promising solution. >>

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Traditional data centers cannot meet the diversified and adjustable service requirements of users.

In the era of connectivity, massive amounts of data are aggregated, developed into algorithms, and turned into key factors that form the basis for business logic and decision making. It is fair to say that data will become the most basic input for production in the future. It is the main fuel for the digital economy. Data centers integrate data, algorithms, and computing power to become the core engine of the digital economy. Both cars and data centers share a similar history of pursuing greater efficiency. For example old car engines consumed a large amount of fuel, and the heat efficiency was only about 20%. This produced large quantities of pollution. Traditional data centers are similar to these outdated car engines. Their energy consumption is high, while production efficiency is low. Because of this, traditional data centers are bound to be upgraded or reconstructed.

A 1% increase in the heat efficiency of a car engine requires tremendous effort from numerous engineers. Since the complexity of a data center is no less complicated than a car engine, improving

data center efficiency can be considered equally difficult. A traditional data center requires a long construction period, huge investment, and complicated management, even though it lacks flexibility. Even a minor change affects the whole data center. Traditional data centers no longer meet customers' requirements for high cost-effectiveness, flexibility, and efficiency. New data centers must be constructed in line with future service development needs. Huawei is one of the pioneers of the new data center "engine". Huawei's data center infrastructure integration service solution shortens the construction period from two years down to six to eight months, achieving fast construction and rollout. In addition, this solution has been designed to have a flexible architecture that supports on-demand capacity expansion. This solution has great advantages in terms of energy savings, environmental protection, and management efficiency.

User requirements have become diverse and changeable. Therefore, a full-stack and full-scenario one-stop solution is required. Huawei is a world-leading enterprise that can provide integrated solutions covering chips, hardware, software, systems, and integration service. Huawei has a rich experience with turnkey projects, and has earned a good reputation in the industry.

Fast deployment and green operation: Case study of Huawei's data center integration service

Dubai International Airport is the world's largest international passenger and logistics transit center. Rapid business growth has overloaded the original data center. With the Expo Dubai 2020 approaching, the Dubai International Airport is in urgent need of new technologies and innovative methods to improve its capacity. IoT is the magic formula that makes airports smart. However, IoT generates massive amounts of data that needs to be transmitted across a full-coverage network. Therefore, a powerful data center is required to provide data transmission, storage, and computing.

The goals are clear, but the challenges are significant:

First, new technologies and functions need to be implemented, and Tier III design and construction certification is required to ensure high security.

Second, because there is no available building at the airport that can be used for the construction of a new data center, the new system must share space with the old system as it takes over services.

Lastly, the new data center must be

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Huawei Data Center Integration Service: Making the Construction of Data Centers Quick and Cost-Effective



delivered and put into use within one year.

Obviously, it is a difficult task. To deal with this complicated situation, Huawei is using the FusionModule1000B prefabricated modular data center solution. The solution consists of 23 containers, covering functions such as data transmission, storage, computing, and it is equipped with in-row precision air conditioners and highly efficient modular UPS products. The total power can reach up to 1 MW. The solution meets Tier III design and construction certification requirements. In this way, all Dubai International Airport needs to do is provide an empty space. After the modules arrive, they can be quickly deployed and put into use. The reliability of this solution reaches 99.98%, and the annual average failure time is only 1.6 hours.

Thanks to its modular design, Huawei was able to build the Dubai International Airport data center in nearly half of the time it takes to build a traditional data center. The climate of the Middle East is hot. However, the in-row precision air

conditioners, highly efficient modular UPS products, and aisle containment inside the modules allows the PUE to be below 1.6, reducing energy consumption by 30% compared with traditional data centers. In addition, Huawei's advanced NetEco management system reduces management costs and simplifies O&M. After the new data center goes online, almost all aspects of the Dubai International Airport will be covered by the IoT. The new data center is supported by big data and cloud computing technologies and the efficiency and quality of all airport services have been improved, from flight information displayed and baggage handling to enterprise goods transportation. In addition, with the improved services, the modular design can be expanded at any time or adjusted as required, which ensures efficient operations of the Dubai International Airport.

Tianjin Zhenyun Technology and Development Co., Ltd. is a platform company. Its campus is based on the IDC cloud computing center. Tenants on

the campus have urgent data service requirements. In addition to high reliability, tenants also require control of investment and operational costs and they need to ensure leading-level PUE is achieved. To meet these requirements, Huawei provides a modular data center solution featuring high reliability, high efficiency, and simplicity. This solution uses digital, networked, and intelligent technologies to ensure high reliability, security, quality, and energy efficiency. The magic formula for this particular situation is the micro-module data center solution, which facilitates fast deployment. All of the modules have been preinstalled and pre-commissioned at the factory, and can be flexibly expanded. 92 micro-modules (2,918 cabinets) are deployed within just four months. In terms of security, the equipment room complies with the Tier III+ standard. The power distribution system uses the 2N configuration, the cooling system uses the N+1 configuration, and the core load system uses the 2N configuration. The data center is based on Huawei's technical



services and has leading advantages in power consumption control, security, and manageability. Since deploying Huawei's modular solution, Zhenyun Technology has improved its brand value and gained recognition from users.

West Africa's Cloud Exchange (DimensionData Nigeria) is a system integration and end-to-end virtual computing company with annual revenue of over USD 7.5 billion. To quickly seize the cloud computing market, the Cloud Exchange needed to launch data center services in a short period of time, and build a high-end data center brand with high reliability. Also, similar to Dubai International Airport, the company did not have a building that was dedicated to the data center's construction. Huawei provided an integrated service solution covering consulting and design, integration implementation, test and verification, Uptime certification, O&M enablement, and maintenance. The FusionModule1000B prefabricated modular data center solution was used. 11 containers

were integrated and commissioned in the factory, and 80 cabinets were delivered within two months. Thanks to the same advanced cooling solution, the PUE is lower than 1.5, even when the data center operates near the equator. The PUE of local traditional data centers is above 2.0. In addition, Huawei met the Tier IV high-reliability design standard, and positioned the data center as a high-end brand in the ISP industry in Nigeria.

Accelerating data center upgrades, and helping industry customers conduct service innovation

The Dubai International Airport, Zhenyun Technology, and the Cloud Exchange are typical examples of global data centers. Service volume is rapidly growing, and new types of services continue to emerge, and traditional data centers need to be improved. Old data centers need to support current services, and new data centers

need to be built to support future services. However, often there is no place for them to be deployed. In the future, old data centers will have to be integrated into new data centers.

As the digital and intelligent transformation accelerates, advanced technologies are being used to solve efficiency problems. The emerging digital economy brings vitality to the global economy. According to the World Internet Conference Blue Book, the global digital economy is worth nearly USD 13 trillion. According to 2018 Global Connectivity Index (GCI), the scale of the global digital economy will reach USD 23 trillion by the end of 2025, an increase of nearly 80% compared with 2017. The rapid growth also means that the economy is about to undergo a large-scale transformation and upgrade, and a new digital economy era is about to arrive. With all of this in mind, irrespective of the current difficulties, it is urgent to begin upgrading and reconstructing data centers.

“ Huawei's industry-leading data center integration service brings customers the full benefits of flexible architecture, short time-to-market, energy savings, and features that provide brand value. This helps industry customers quickly and economically obtain an environmentally-friendly yet powerful digital engine designed for the digital era. In this way, you can focus more on service innovation and customer requirement fulfillment, and also share in the USD 23 trillion economic dividend brought by the new digital era. ”

Five Keys to Smart City Services

By Zheng Kai, PPtech

Smart cities embody the integration of sustainable city development and the next round of IT transformation. With the rapid development of technologies such as cloud computing, Internet of things (IoT), big data, and artificial intelligence (AI), smart cities are now sweeping across the world.

In many successful smart city projects, the most difficult part has been the service implementation. Evaluating the last mile of the smart city solution implementation raises the question, should smart city services play a critical role?



Four Challenges Facing Smart City Implementation

The smart city is not a new concept. In fact, the digital city appeared in the information era and the wireless city emerged in the Internet era, but the smart city had not been clearly defined until the digital era.

Unlike traditional informatization, a smart city is not simply the combination of informatization in all industries. Not only is a smart city a top-leadership project, it reshapes the digital capabilities of all industries in a city, while also addressing systematic challenges. The points below highlight development challenges of smart cities:

First, decision makers are in higher positions, and they are responsible for designating the "top-leadership projects". A smart city is a huge undertaking requiring top-level design. The top-down planning covers the specific vision of a smart city, project execution, assessment criteria, subsystem collaboration, interconnectivity, and inter-department information processing. Therefore, a good top-level design is a prerequisite for a successful smart city.

Second, a city is complex. It covers almost all major sectors and subsystems, such as transportation, education, environmental protection, communications, tourism, industry, and commerce. To integrate and connect these subsystems, we start by integrating data. We need to focus on platform construction either in industry construction or unified city planning.

The third challenge is capital. Each city has different financial status. Government funds alone cannot support the entire smart city construction process. Diverse sources of capital will become an important feature of smart city construction.

The last challenge is about service. A smart city project involves complex scenarios, such as cloud data centers and big data systems, as well as a full complement of ICT products from multiple vendors. The traditional delivery service mode in which vendors separately deploy their own products cannot meet smart city service rollout requirements.

In other words, smart cities have more complex scenarios and stricter requirements. A more comprehensive, proactive, and integrated service solution is needed to ensure smooth project implementation. The solution should involve a customer business enablement solution, an overall service solution, cross-product planning and design, project operations experience, and experts with strong product integration and project management capabilities.

Five Keys to Smart City Services

In smart city construction, various "brains" have been proposed but none of them have been able to solve the issues existing along the path from the "brain" to the "nerve endings". In fact, the network architecture of a smart city is like a nervous system, and it requires additional services, similar to synapses.

Huawei believes that a smart city is like an organism. The vitality of this organism comes from its "nervous system". Behind this nervous system is Huawei's digital brain, an intelligent city operations management platform that fully integrates technologies and processes. The platform uses cloud, IoT, and other innovative technologies to implement closed-loop management, from front-end sensing to data transmission, decision-making, and action. In this way, a city functions properly.

Huawei has acquired a profound understanding of smart cities. Based on this knowledge, Huawei now has five keys to smart city services, and these five keys help address the preceding four challenges.

First, the overall city planning must meet the business requirements of multiple industries. Based on the industry feature analysis, Huawei will centrally plan the overall architecture, resource pools, and service catalogs so that the ICT systems can better support the businesses. Then each system is optimized to meet specific requirements of those industries.

Second, cloud services must be managed in a unified manner for enhanced quality. In the case of complex network architectures and scattered resource pools, Huawei can centrally manage resources and services and provide high-value services, such as disaster recovery and data sharing. This should encourage government departments to migrate their services to the cloud.



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Five Keys to Smart City Services

Third, standard operations are required to smoothly move services to the cloud. The live networks of different departments may have varying specifications. Therefore, unified standards are required to reduce the difficulty in cloud migration. As services are migrated to the cloud, Huawei investigates the capacity requirements in advance and takes these requirements into consideration when designing solutions, so as to support elastic scalability and resolve potential capacity issues.

Fourth, proactive O&M is required to ensure high stability, efficiency, and security. Huawei establishes a clear O&M mechanism and specifies the O&M responsibilities of multiple parties. It also uses the tool platform to monitor O&M networks and builds O&M rule models, with the aim of detecting system health risks.

Fifth, application integration is the focus of ecosystem construction. The partners' applications are integrated into Huawei's platform, making the cities smarter.

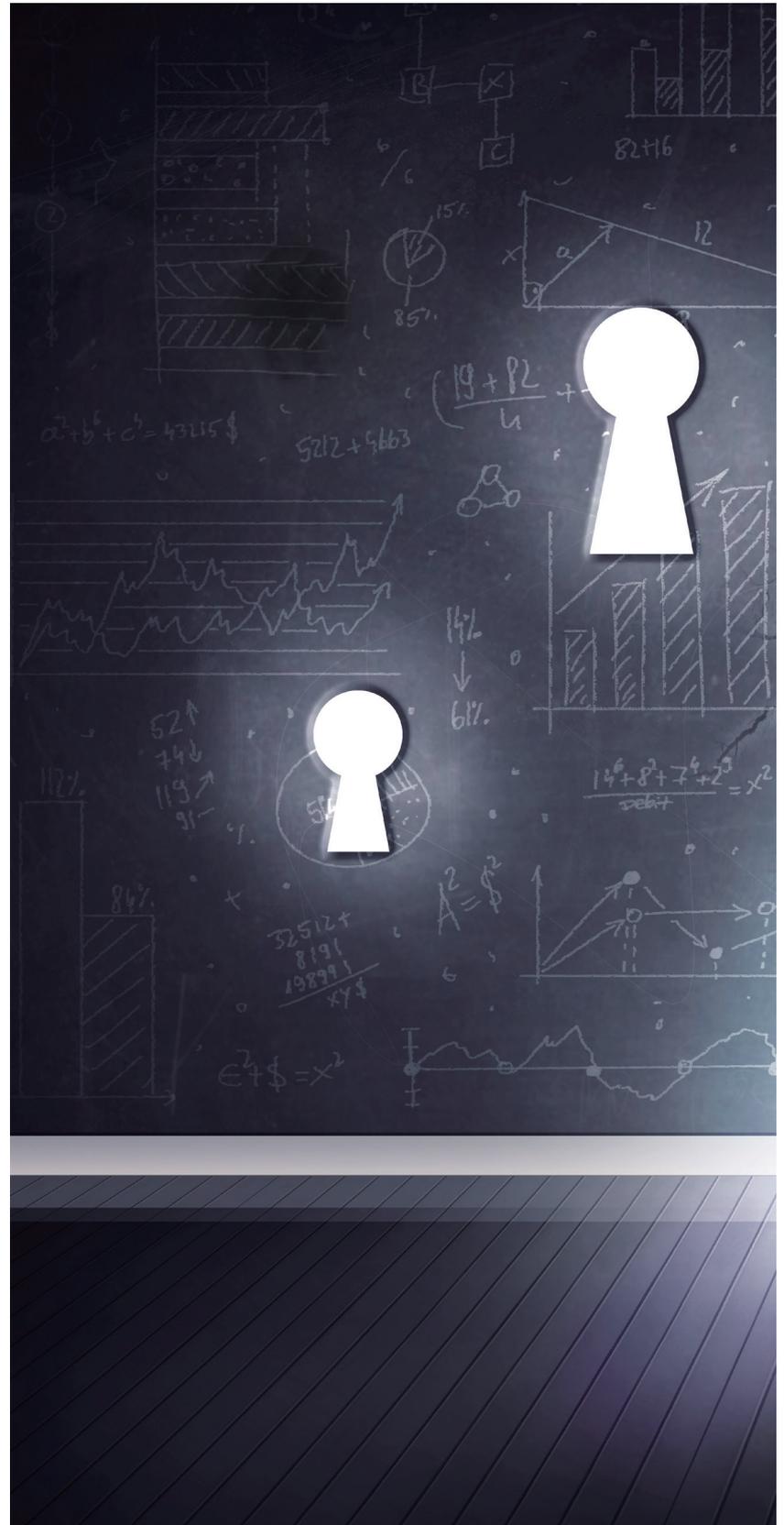
Smart City Implementation Requires Both Industry Experience and Scenario Capabilities

In fact, the biggest challenge of smart city services lies in the lack of cross-industry service experience. Huawei has accumulated its own service experience, gained from years of practice. For instance, projects of e-Government cloud, education, policing cloud, smart healthcare, smart transportation, and Safe City have offered Huawei clear service methodologies and capabilities.

Huawei's digital brain integrates scenario-specific solutions, including collaborative command, smart education, and smart social welfare systems. For example, the collaborative command module displays the daily operating status and warnings, and also supports collaborative command and big data-based decision-making in emergencies. With the integration verification center, and tools for planning, design, and integrated implementation, Huawei is able to deploy applications in more scenarios.

Huawei's smart city experience derives from real word implementation, such as Ekurhuleni in South Africa, Rivas in Spain, as well as Gaoqing, Tianjin, Yiyang, Sanya, and Dunhuang in China. The success of smart cities depends on the replication, reconstruction, and optimization of service experiences. Huawei has supported the implementation of smart city services with its global experiences. Most of these experiences are unique to Huawei.

In addition, Huawei has the strongest service system in the industry, involving professional knowledge bases, professional service tools, and a rich talent pool. Huawei also has a robust partner ecosystem. So far, together with partners, Huawei has deployed its smart city solution services in more than 120 cities across over 40 countries. To sum up, Huawei Enterprise Service has successfully supported smart city implementation by leveraging its powerful service system, rich industry implementation experience, and five keys.





Building a Smart, Self-Service and Automated Service Platform

By Yang Hao, Huawei Technology Planning & Solution Dept

Dou Chun, Huawei Consumer BG Software Engineering Architecture Design Dept



The goal of ICT is to provide efficient and reliable smart products and services, completely free for customers, to create greater value

From mechanization and electrification to automation and intelligence, tools are doing more and more things, and people are less and less involved. As technology develops, human beings are increasingly focusing on creative work, and delegating repetitive work to tools and machines. After the three industrial revolutions of mechanization, electrification, and automation, we are now facing the challenge of intelligence.

Consider transportation as an example. In the era of mechanization, people invented bicycles, increasing our travel speed from about 5 kmph to 20 kmph.



In the age of electrical engineering, with the emergence of steam locomotives, diesel locomotives, and electric locomotives, travel speeds increased to about 100 kmph. Constant oil and power supply enable endless running of vehicles.



In the automation era, automatic cars make driving simpler and navigation systems have become more advanced.



In the upcoming smart era, self-driving will enhance collaboration between people and vehicles, and some or most manual operations will be automated. Driving efficiency will be improved and traffic accidents and fatalities will be greatly reduced. Moreover, new energy and smart manufacturing will significantly reduce environmental pollution and provide a better and more harmonious living environment.

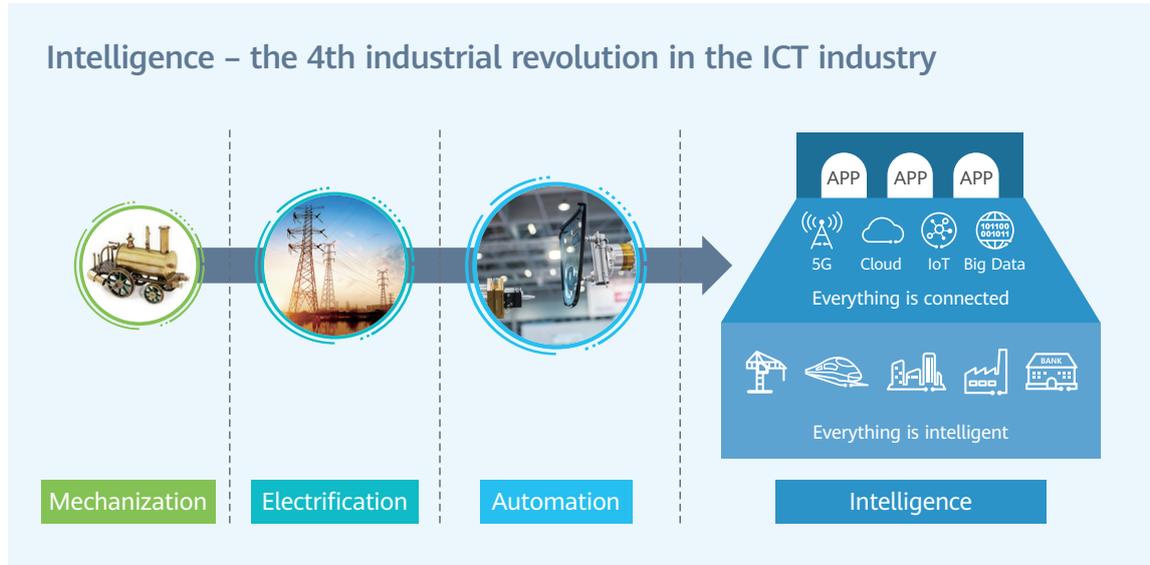


The ICT industry is also facing challenges posed by the fourth, "smart" industrial revolution:

- » How do we use 5G, cloud, and IoT to build an intelligent big data platform?
- » How do we use smart chips and algorithms to provide intelligent solutions for various industries?
- » How do we stay close to customers and provide them with smart applications that are readily accessible, secure, and reliable?

Futuristic Technologies

Building a Smart, Self-Service and Automated Service Platform

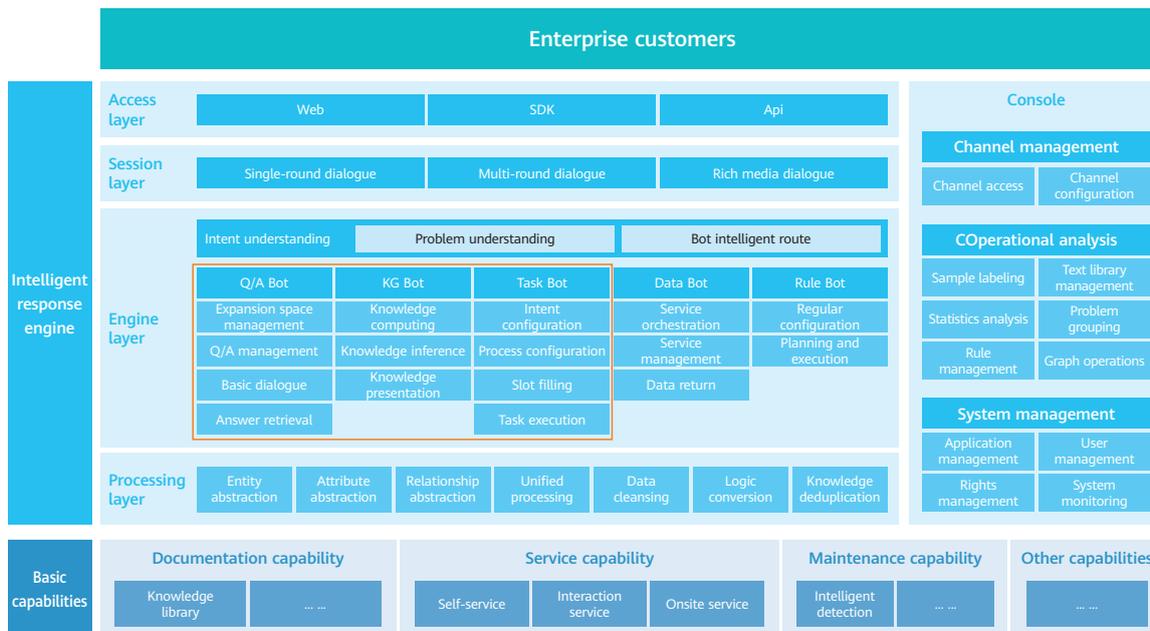


To provide smart services in ICT, a smart service platform with mutual, self-service and automation capabilities must be offered based on smart customer service

The main objective of mutual services is to solve the problem of "understanding what's been said." A QABot with question and answer management capabilities is provided to replace agents, solve most consultation problems, and transfer complex consultation problems and fault problems to manual service personnel.

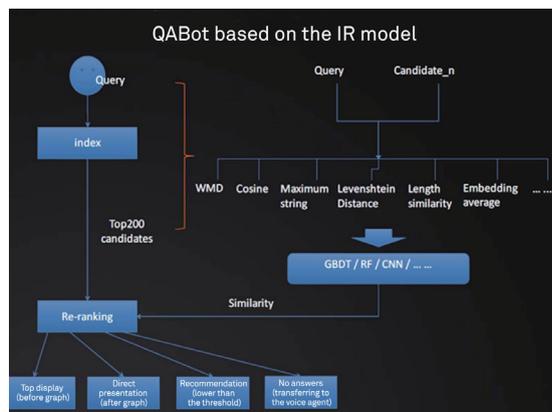
The main objective of self-service is to provide KGBots with "knowledge cloud + knowledge graphing" capabilities to replace domain experts, in order to solve complex consultation problems and simple fault problems, and transfer complex faults to agents.

The main objective of automation is to provide TaskBots with "device monitoring + intelligent O&M" capabilities to replace operation scripts and solve complex fault problems in a semi-automated manner.



The mutual QABot can respond to customers 24/7 and solve simple consultation problems, but it is not so smart

The Information Retrieval-based (IR-based) QABot can segment user queries and sort questions by weight such as TF-IDF to obtain 200 or more candidate results. It then performs deep learning multi-dimensional rearrangement on the candidate results according to factors including literal meaning, popularity, and semantic meaning. If the score of the first search result is high, the QABot will forward the result to the customer. Otherwise, it transfers the problem to the agent.



The Q&A management platform manages Q&A categories and knowledge points, analyzes big data regarding user questions, and adds answers to questions without search results.

The QABot utilizes a knowledge base and Q&A matching engine to respond to customer questions 24/7. For repeated questions or existing questions in the knowledge base, the answers are very accurate.

In actual ICT services, iKnow and customer service personnel (engineers) work together to serve customers. Robots are mainly used to solve simple and repetitive consulting problems, thereby ensuring answer accuracy and improving customer satisfaction. For complex consultation problems or faults, our customer or partner can contact customer service personnel and Huawei engineers. Customer service personnel and Huawei engineers can access the customer network and make decisions to solve the problems if necessary.

However, there are two issues:

Humans can easily understand and deduce a complex question. For example, question A = question B + question C. This is very easy for humans, but it is very difficult for the QABot to deduce and answer these questions.

If question A is described differently by the customer and the expert, and the QABot does not provide the bridge for the customer and the expert to communicate, the problem may still be difficult to solve for the customer even after expert explanation.

Without effective knowledge reasoning and generalization capabilities, the QABot always offers awkward answers and does not act intelligently.

(<https://baijiahao.baidu.com/s?id=1551784061302829&wfr=spider&for=pc>).



Futuristic Technologies

Building a Smart, Self-Service and Automated Service Platform

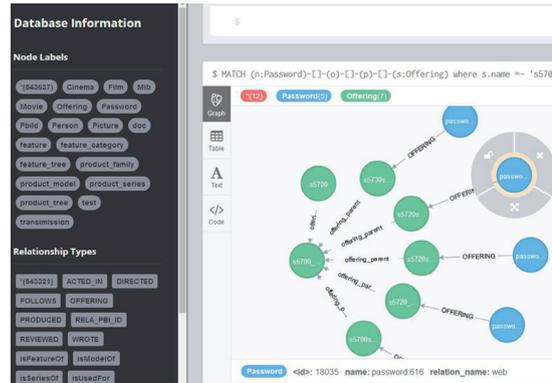
The GBot is more intelligent, as it supports problem reasoning and knowledge accumulation, and solves complex consultation problems

The knowledge graph (KG) is a structured semantic knowledge base, and is used to describe concepts and relationships in a physical world with symbols. A basic unit of the knowledge graph is an entity - relationship - entity triplet, and the entity - entity attributes - value pair triplet. Entities are interconnected through relationships, forming a knowledge mesh. The knowledge graph enables the web to change from web page links to concept links. Users can search for information by topics instead of character strings. Based on the knowledge graph, the search engine can provide structured knowledge to users in graphics. Therefore, users do not need to browse a large number of web pages, and can accurately locate and obtain knowledge. For example, is Cristiano Ronaldo one of the best football players? C. Ronaldo won the Golden Ball, which is one of the most influential football awards, so we can infer that he is one of the best football players.

(Source: Knowledge Graph and Cognitive Intelligence --- Xiao Yanghua)



The KGBot can use structured knowledge to perform knowledge reasoning. It provides multiple rounds of questions and answers to clarify user context and solve complex consultation problems for customers.



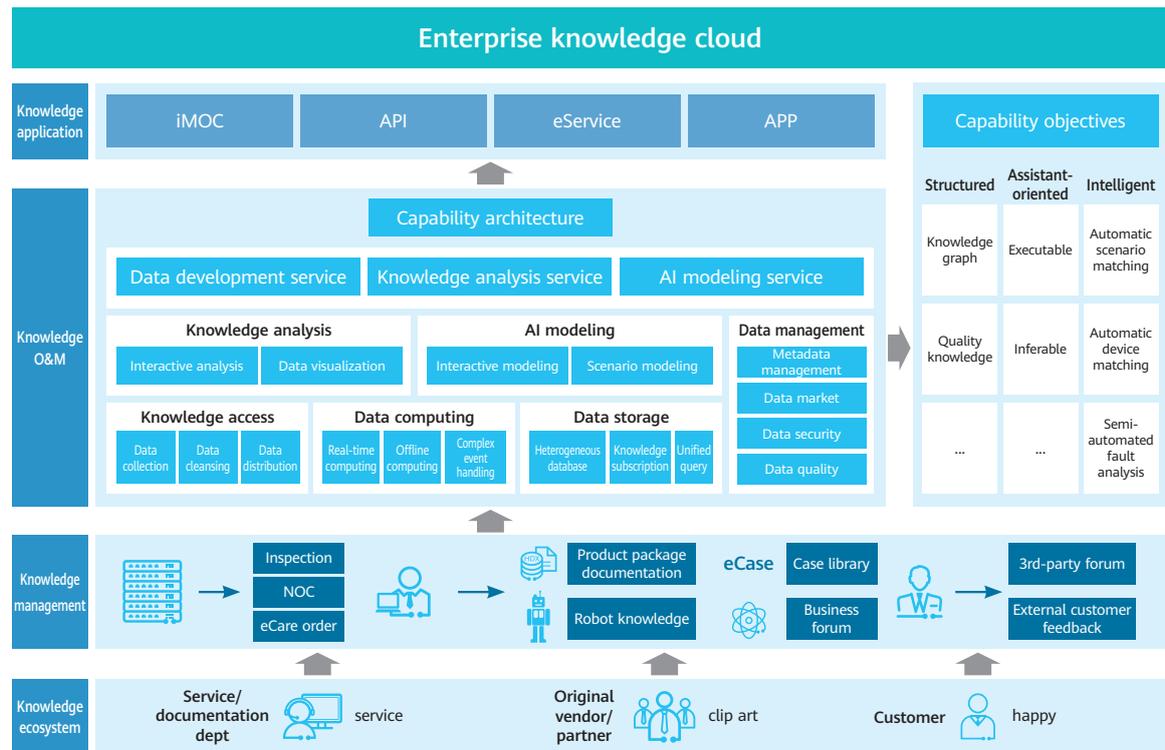
The ICT knowledge graph platform includes the product, MiB, password, alarm nodes and relationships. Compared with traditional QA search, KGBot supports the following functions:

For standard questions, standard answers can be offered without inference. For example, when a user queries for the password (what is the password for S5720 SI?), the answer can be provided immediately.

For non-standard questions for which no standard answers can be matched, reasoning and inference are required. In the same password query scenario, if a user asks what the password for S5700 is, KGBot can use the PBI and password tool to conduct reasoning, and provides final answers through multiple rounds of questions and answers based on numerous knowledge results. For example, S5700 series products contain S5720 and S5720 SI. KGBot can determine what specific product the customer intends to ask about through multiple rounds and questions.

It can be likened to entering a shop and asking for a cup of cola, the waiter may ask whether you want Coca Cola or Pepsi. KGBot also asks you questions to find out whether you need the password for the high-end S5720 HI, or for the low-end S5720 SI.

In addition, an enterprise knowledge cloud that supports device-cloud collaboration is the only way forward for smart customer service.



Explicit knowledge is knowledge expressed in written words, diagrams, and mathematical formulas, such as documents and PPT materials. Explicit knowledge can be likened to the tip of an iceberg above the sea. Implicit knowledge refers to knowledge that exists in the brain, such as skills, secret methods, intuition, and concepts of excellent employees. Implicit knowledge is like the huge iceberg that lies below the water, which is difficult to notice.



On the one hand, we construct knowledge graphs of explicit knowledge for knowledge structuring and reasoning. On the other hand, we need to build a platform to manage the implicit knowledge under the surface and gradually make it explicit. For example, the feedback from an external customer may be the root cause of another customer's problem. The problems found in an inspection may be an important source of KPI exception detection for the next time.

In addition, due to security issues, customer networks and data cannot be synchronized to the cloud for analysis and processing. However, without external data and features, customer problems may not be located. The device-cloud collaborative knowledge is the solution for this. Based on massive documentation knowledge, expert forum knowledge, and O&M knowledge, the cloud platform trains machine learning and deep learning models such as root cause location, disk detection, and KPI analysis. When customers conduct onsite fault location, they can go to the cloud to assist end-to-end testing in problem location. The effects of end-to-end testing are good for locating faults. On the one hand, knowledge can be desensitized and moved to the cloud after customer approval. On the other hand, the model can be adjusted, desensitized, and synchronized to the cloud for future fault location.

Futuristic Technologies

Building a Smart, Self-Service and Automated Service Platform

The TaskBot supports customer environment awareness, smart O&M, decision making, and resolves faults

The TaskBot is a customer service robot that performs smart O&M based on network environment and device status. It is also a semi-automatic tool for resolving customer faults, especially complex faults. Similar to L3 and L4 in self-driving, faults are classified by customers. Service availability faults can be rectified before reporting. However, if a service security fault occurs, the TaskBot confirms the fault and then rectifies it. According to Gartner's Intelligent O&M Analysis Report (2018), in the future, the proportion of enterprises utilizing smart O&M (AIOps) will reach 60%, and half of all faults will be automatically repaired. Therefore, using the TaskBot to realize fault self-recovery is the only way forward to automated customer service.

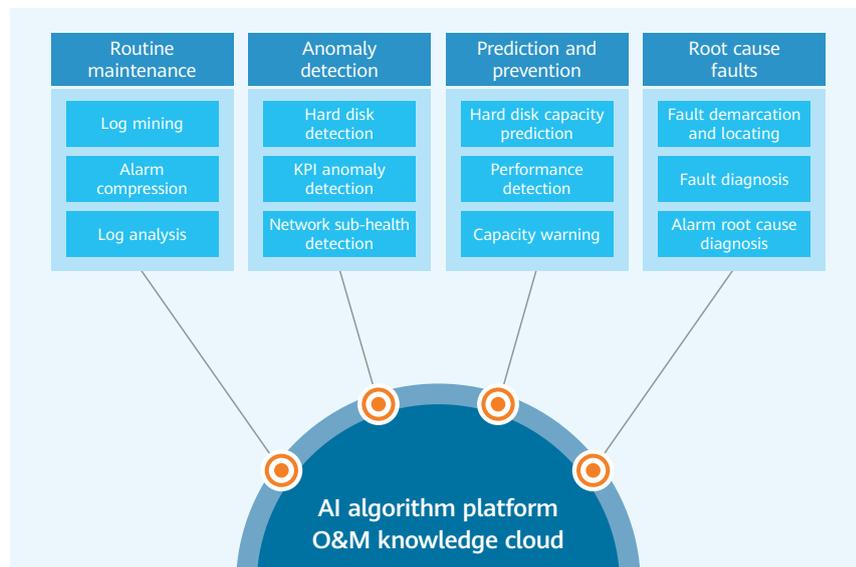
Faults, especially faults related to multi-device interconnection, are closely related to the customer network environment and device running status. In addition, analysis methods and diagnosis models vary with fault type. To resolve customer faults, the TaskBot needs the cloud bastion host and the probe to probe into the network environment and the context status of device operations. It also requires smart O&M algorithms and decision-making capabilities for different O&M scenarios. These are the most important features of the TaskBot. Similar to KGBot's device-cloud synergy, the TaskBot also requires device-cloud synchronization. Unlike the KGBot that returns only solutions, the TaskBot can run on the client and provide services independently, which is dubbed as "smart assistance" in the industry.

The TaskBot network agent, including the bastion host and probe, can obtain the networking and device run status while ensuring security. The networking status, fault environment, network cascading status, and the switch stacking status are all important for fault demarcation and root cause location. Similar to the coffee

shop scenario, the system is unlikely to recommend soybean milk to you. The run status of devices is especially important in traffic prediction or sub-health detection. A sudden traffic surge at one point may be the root cause of network interruption in the next.

The TaskBot's O&M decision-making is another important component of customer self-service. The TaskBot's O&M decisions can be classified into four types: (1) routine maintenance, including log mining, alarm compression, and log analysis; (2) exception detection, including disk detection, KPI exception detection, and network sub-health detection; (3) prediction and prevention, including disk capacity

prediction, performance prediction and capacity warning; (4) root cause analysis, including fault demarcation and location, fault diagnosis, and alarm root cause location. Time-Space decomposition is a common algorithm for log compression. KPI classification/clustering is a common algorithm for KPI exception detection. Time sequence prediction algorithms such as ARMA are core algorithms for disk capacity prediction and warning. Collaborative filtering and association analysis are core algorithms for fault demarcation and locating. For the four scenarios, the TaskBot provides 20+ typical machine learning and deep learning algorithms to enable customers to analyze problems and perform self-service.





The challenge of ICT is how to build a secure and reliable customer service platform to provide efficient and reliable smart products and services

At the forum of State of Security Governance 2017- Where Do We Go Next of Gartner's Security and Risk Management Summit, analyst Marc Antoine Meunier delivered a speech, in which he compared data security governance to the "eye of a storm", emphasizing its vital importance in data security.

Secure and reliable smart products and services are also the digital twin requirements of "intelligence". How to define and implement data security governance in the smart customer service system, how to build data security and provide reliable services, and how to integrate into network security and ecosystems are the new challenges for customer self-service.

First of all, we need to understand that data security governance is not just a product-level solution that combines tools, but a complete chain that runs through the entire organizational architecture from the decision-making layer to the technical layer, and from the management system to tool support. Industry experts, third-party service providers, partners, customers, and organizations at all levels must reach a consensus on the objectives and purposes of data security governance and ensure that appropriate measures are taken to protect information resources in the most effective manner. This is also Gartner's basic definition of security and risk management.

The four important steps for data security governance include how to customize the data security governance process, including establishing the management accountability system and decision-making permissions, determining acceptable security risks, controlling security risks, and ensuring the risk control effectiveness. Data

security governance must be a complete closed loop. Security assessment and specific indicator measurement must be performed to ensure that risks are effectively managed. Otherwise, the first step must be performed to correct the whole process.

Gartner's Information Security Governance Process



Gartner

Then, how do we tell good governance from bad governance? After setting objectives for the data security governance process, decision makers need to pay attention to several key indicators to determine whether the data security governance work is healthy and lighten the burden of enterprises. Gartner also provides several evaluation criteria for us.

Bad governance	Good governance
<ul style="list-style-type: none"> • Insufficient fund • Protecting the wrong data • No business involvement • Decisions made by wrong persons • Continuous emergency response • Inflexible in adapting to changes • Things that may cause fines and even criminal punishment for the enterprise 	<ul style="list-style-type: none"> • Developing a clear accountability system • Higher profits and lower investments • Making the enterprise more ethical • Aligned with privacy goals • Aligned with business objectives • Support from the high-level managers • Proper and reasonable risk management

Status of data security governance

Data security governance is also a long-term challenge for mutual, self-service, automated, and intelligent services.

Focusing on Customer Experience with Intelligent Support Services

By Mu Mingjing, Senior Engineer, Huawei Enterprise Global Service Center



Huawei Enterprise Global Service Center is a one-stop service platform developed by Huawei for its enterprise business. It provides technical support, remote delivery, and network O&M. Based on the SPORTS model, site (S), process (P), organizations & people (O), regulatory (R), technology (T), and services (S) have been assessed since the beginning of development. In the next 1-2 years, we will enter the optimization phase and continue to improve our services, process, and technology.

	Service	Process	Organization	Regulation	Technology	Site Selection
L0: Capability not supported						
L1: Primary	Service relationships, settlement mechanisms, performance management, customer-centric culture, and excellence of service	Process scope, business scope, standardization, and excellence of process	Organization, customer scope, employee management, and governance & control	Compliance with laws and regulations	Application, general technical support, portal/access, and technical excellence	Site selection, shared service operation, site selection strategy, and excellent site selection
L2: Repeatability						
L3: Defined						
L4: Manageable						
L5: Continuous optimization						

Table 1: SPORTS model evaluation criteria

As soon as we started the enterprise business, we established an adapted service process system and organization based on carrier domain practices, the ITIL V3 framework, and enterprise business characteristics. Currently, the Enterprise ITR (Issue to Resolution) process is operated as an end-to-end enterprise technical support process and is continuously optimized for multiple rounds to ensure efficient and compliant organizational operations. Three global service centers (GSCs), five regional technical assistance centers (TACs), and four country TACs have been established worldwide to form a three-level technical support system. The system can handle customer problems in 17 languages and provide customers and partners with quality service around the clock. Huawei deploys one global spare parts center (located in Shenzhen), five regional spare parts centers (located in Shenzhen), and over 1000 city-level warehouses to provide professional services 24/7. Currently, Huawei provides NBD services in 97 countries and regions, with 60 countries and regions (over 500 cities) enjoying 4-hour spare parts delivery. Spare parts service capabilities are continuously developed and improved based on business development and customer requirements.

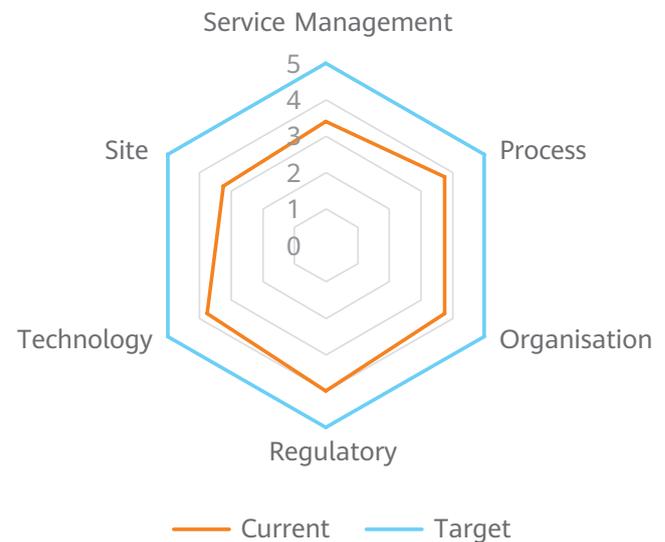


Figure 1: SPORTS model evaluation

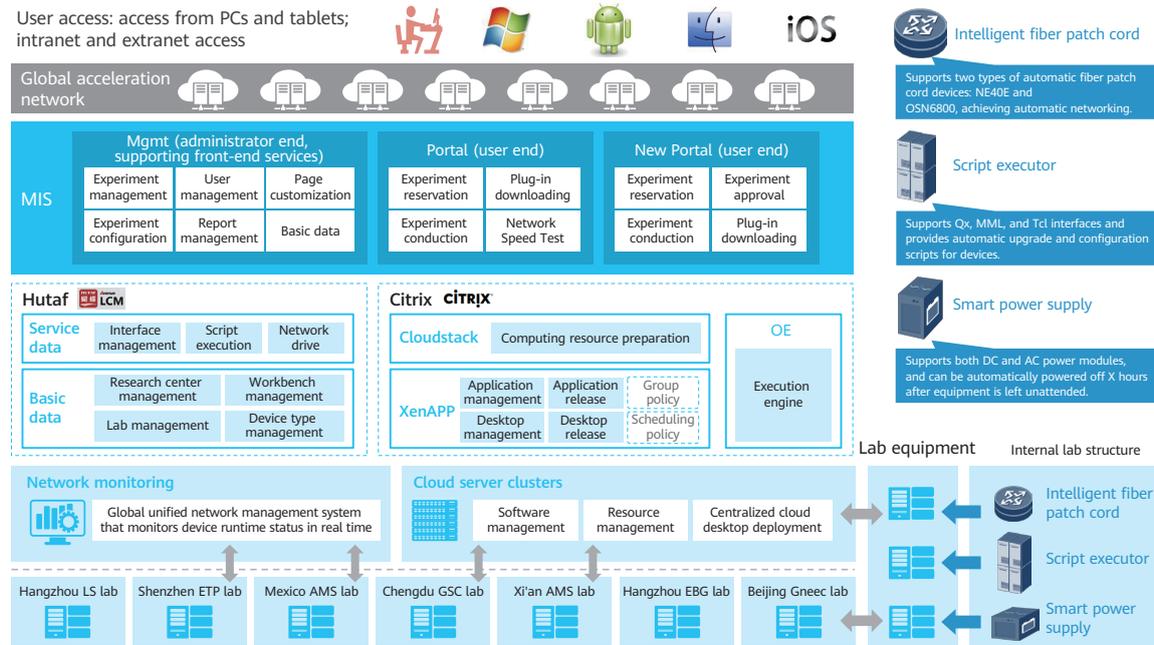


Figure 5: eLab architecture

Cloud-based lab resources, providing a complete online practice environment and fault simulation

Hands-on practice is an effective way to prolong memory time. Sufficient practice is required to improve employee ICT knowledge. It is, however, difficult to organize hands-on practice in a centralized manner. Engineers can hardly spare a large amount of time participating in centralized training, and significant investment is required to construct, operate, and maintain an all-scenario lab in each region.

To address this challenge, Huawei built a distributed cloud-based lab platform: eLab. Engineers can book lab resources on demand from anytime and anywhere, remotely access the lab, and flexibly and conveniently practice operations and simulate faults.

The eLab platform supports the entire "booking - approval - delivery" process. Devices are automatically networked 30 minutes before the experiment. After the experiment, patch cords are automatically removed.

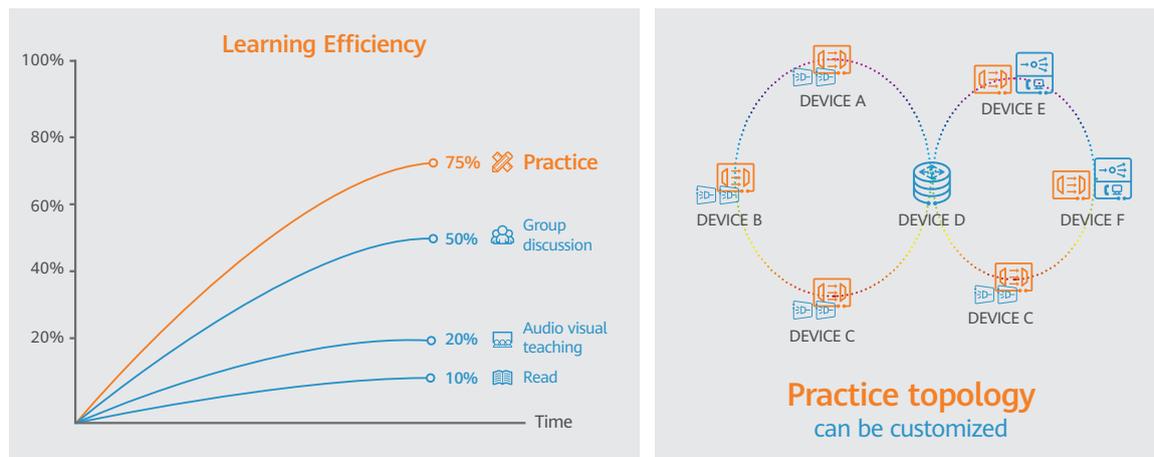


Figure 6: Globally shared lab platform, improving the skills of assistant engineers

Futuristic Technologies

Focusing on Customer Experience with Intelligent Support Services

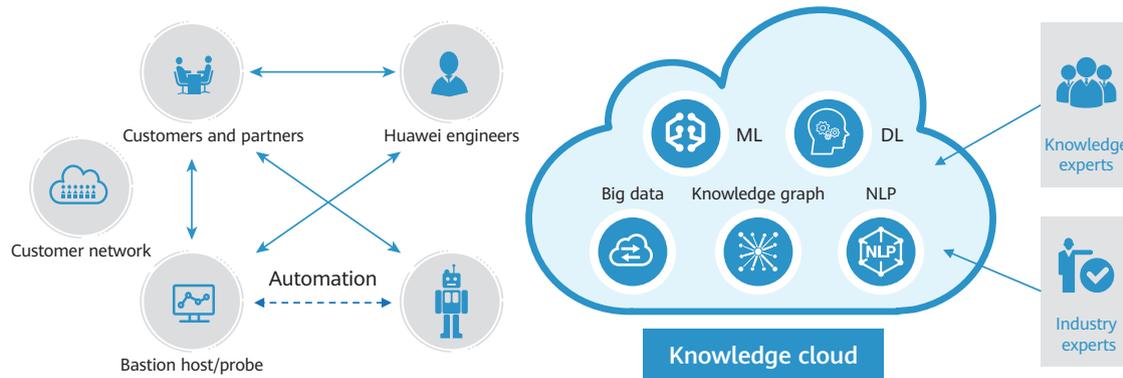


Figure 7: Vision of the future self-service platform

Focus on customer experience and build an intelligent and visualized service platform

A practice combining intelligent customer service ABC (artificial intelligence, big data, and cloud)

With the continuous development of artificial intelligence and big data technologies, intelligent customer service bots are continuously improving the intelligent level of services. In Huawei's practice, intelligent bots are continuously evolving, from initial "search + Q&A" to task-based multi-round interaction. Based on technologies such as deep learning and knowledge graphing, engineers continuously train bots to improve their accuracy and enable them to invoke existing knowledge more intelligently. As we can see from the 2019 roadmap, the interaction mode will be more intelligent, and voice recognition functionality will be added. Behind the bot, big data is used to collect and analyze customer problems, help form knowledge cases, and build a "knowledge cloud" with back-end experts to help the bot provide a better self-service experience to users.

With the popularization of IoT applications, the intelligent customer service system will interconnect with the probes and bastion hosts deployed on the customer network. In this way, the intelligent system will not only solve consultation problems, but also respond to customer faults in a more intelligent manner. It will even have the capability to analyze time sequences based on big data, and conduct hard disk fault detection and KPI analysis to help users reduce network risks more easily.

One-stop self-service management platform of Huawei products for end customers

Huawei users are obviously concerned about the run status of Huawei products they use. Has the service expired? What are the current problems? No need to worry. Huawei provides you with a powerful tool, the ServiceCare Portal. Through this self-service platform, you can view information about all company devices of in real time, such as device inventory, maintenance information, fault logs, product documents, and service reports.



Figure 8: ServiceCare functions

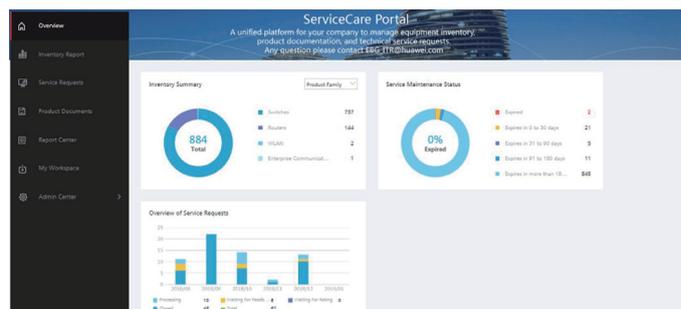


Figure 9: ServiceCare user interface

Huawei Enterprise Service WeChat official account + Enterprise Technical Support application, meeting your mobile office requirements

With the wide use of smartphones, mobile O&M requirements are also attracting attention from Huawei engineers. The Huawei Enterprise Service's official WeChat Account and the enterprise technical support application allows you to interact with our smart customer service, consult online customer service, and query maintenance and spare part statuses. You can learn about the most common troubleshooting methods from the troubleshooting guide.

Download the enterprise technical support application to experience its powerful functionality. All official account functionality is available here. You can create issue tickets, activate licenses, have a product documentation AR experience, download command and alarm query tools, and scan device barcodes to quickly identify product information. You can also communicate with other users and Huawei engineers in the community anytime and anywhere.

Due to limited space, my introduction ends here. I believe that more black technologies will be applied to engineers' daily work in the future. I also hope that Huawei customers and partners can use our applications and the ServiceCare Portal for a better service experience.

How to download the enterprise technical support application?

Method 1: Scan the QR code.



Method 2: Find it on the app store.

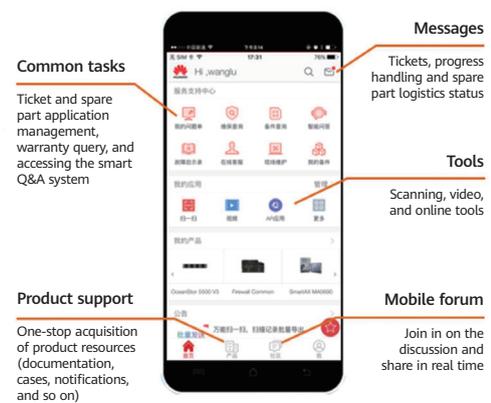


Figure 10: Enterprise technical support application



As new businesses are formed, new modes of operation, and new technologies are increasingly disrupting traditional industries. Most global enterprises reach the conclusion that digital transformation is imperative. Professional operation and maintenance (O&M) services play a key role when enterprises go digital. This is why the O&M management of information technology (IT) infrastructure is changing.

Data center O&M service departments no longer focus solely on infrastructure, they also focus on the platform and upper-layer applications. As the enterprise IT architecture evolves towards cloud computing, the flaws of traditional passive O&M, which is manual in nature, are exposed. Enterprises are attracted to automatic O&M because it integrates services and products. In the future, the combination of big data and artificial intelligence (AI) technologies is expected to further reduce enterprises' dependence on O&M personnel. This will be done through machine analysis, judgment, and decision-making, thereby promoting the development of an automatic and intelligent O&M process. >>



Huawei I•MOC Platform: Facilitating Enterprise O&M Transformation Based on Huawei's 30 Years of Experience

By He Zhirong, Huawei Enterprise Service Senior Service Expert

Deng Xiangyu, Huawei Enterprise Service O&M Architect

O&M Problems in Digital Transformation

Problem 1: The limited use of automatic O&M processes extends the time required to bring resources online. Due to lack of digital process management measures, service provisioning activities such as VPN applications and network provisioning are completed using manual operations. Resource application and provisioning requires offline communication among personnel, which is a time-consuming and labor-intensive delivery process. Due to the lack of standardized processes, process management and control is inadequate, resulting in unresponsive services. In addition, the lack of automatic inspection tools means that service logs must be manually filtered. Most service log analyses are imprecise, without analysis and lacking in service quality.

Problem 2: The O&M modes are too scattered for related owners to coordinate. Each department uses O&M tools from various manufacturers, which often have different compliance standards. Since these tools cannot be effectively connected with each other, the O&M capability of each department is not able to be shared. A large number of device types lead to siloed O&M models that are difficult to monitor in a unified manner. Resource usage lacks transparency because unified resource management and O&M does not have unified configuration management. Resources are wasted. Due to improper life-cycle management, assets are blindly added, leading to invisible resource usage by zombie hosts. It has been shown that cloud data center services often integrate internal

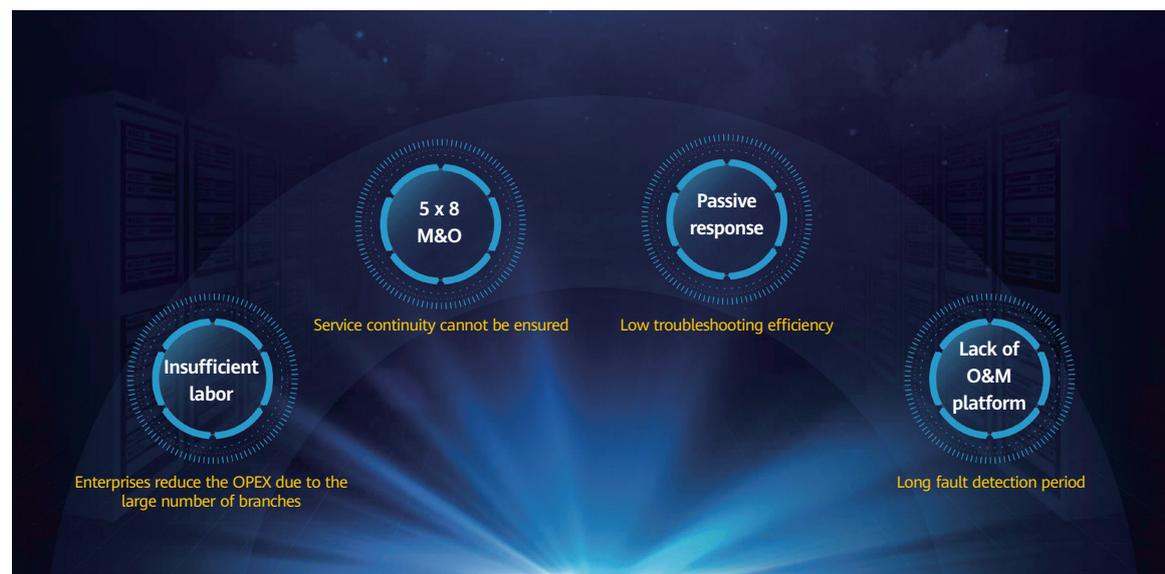
services provided by multiple parties. If different service providers use varying technology stacks and protocols and offer separate services, it will be difficult to achieve effective overall coordination.

Problem 3: The O&M team lacks capabilities and is overly reliant on core personnel. The O&M team is unable to provide constant high-quality 24/7 services. Once the core personnel are absent, the service quality may deteriorate. Team members do not readily summarize their personal experiences to develop organizational capabilities. In addition, there is no repository platform for team members to create automation scripts or document the knowledge base and share organizational experiences.

Problem 4: There is no unified platform for automatic network inspection, traffic monitoring, and anticipation of network errors. Traditional O&M tools and methods only generate alarms when a fault occurs. The O&M work is then carried out after a fault has occurred. This requires remedying what has been lost. In addition, some O&M personnel are not even aware of a fault until they receive complaints about a service interruption.

O&M Transformation Establishes the Foundation for a Successful Digital Transformation

Digital transformation gives rise to many O&M problems. Therefore there is an urgent need for O&M transformation. Enterprises are utilizing rapidly growing ICT resources and



Futuristic Technologies

Huawei I•MOC Platform: Facilitating Enterprise O&M Transformation Based on Huawei's 30 Years of Experience



using fast developing technologies in increasingly extensive business scenarios. Enterprises need to make large investments into human and material resources. A top priority is employing "generalists". Generalists have a wide range of ICT knowledge, which is needed to maintain the complex O&M systems. However, an individual's capacity is limited. Even outstanding O&M generalists cannot monitor a large number of services 24/7, nor are they able to quickly deduce faults based on the wide range of possible alarms. For enterprises, the cost of recruiting O&M generalists is high. In addition, since the O&M is managed by people, a significant amount of interpersonal communication is inevitable, which means that many business departments will also be pulled in during the O&M process.

O&M transformation trend 1: AI technologies are spurring the evolution from traditional O&M to artificial intelligence for IT operations (AIOps). AIOps is based on highly complete O&M automation technology. Through the use of machine learning, the system continuously extracts and summarizes rules from O&M big data

such as logs, monitoring information, and application information, and then it makes intelligent analysis and decisions to achieve the overall objectives. The self-analysis, self-judgment, and self-determination of machines will gradually reduce the risks caused by an over reliance on O&M personnel. AIOps is expected to become a new growth point in the O&M field.

O&M transformation trend 2: Application O&M has become the focus for cloud users. O&M departments of many enterprises primarily perform basic O&M (for enterprise IT infrastructure) and application O&M (for specific enterprise services). Some large-scale O&M departments may also establish O&M development teams to develop O&M tools and platforms.

When customers decide to migrate to the cloud, especially an IaaS public cloud, they are handing over the basic O&M and related tool platform development work to the cloud providers. When O&M departments put application O&M at the heart of their work, they are achieving the intended design objective of cloud computing, which allows users to focus on

their service development. By taking this approach customers' top concern can be focused on ensuring the stable running of main services.

O&M transformation trend 3: Flexibility and self service have become basic requirements for transformation infrastructure. Traditional infrastructure cannot be flexibly used. Therefore, to streamline resource management and planning, many O&M teams set rules and procedures for the use of the infrastructure. However, when applied to cloud infrastructure management, these rules and procedures weaken the infrastructure's flexibility.

Enhancing infrastructure flexibility and the degree of self service with measures such as automatic service expansion and reduction can greatly reduce O&M costs. In addition, as the infrastructure costs become flexible, the operational costs of the entire service are reduced, and the market competitiveness is improved. Cloud not only enables infrastructure flexibility, it also enables the large-scale deployment of self-service IT infrastructure services. Any

user can obtain required infrastructure resources within minutes. This greatly improves the iteration speed of the entire process and reduces the time O&M personnel spend on resource provisioning and statistics collection.

O&M transformation trend 4: The value of third-party O&M services is becoming increasingly clear, and the number of key application fields continues to increase. The complex heterogeneous environment of enterprise IT infrastructure requires a highly professional data center O&M team that can provide specific O&M services for different software and hardware. As the data center O&M services evolve from hardware O&M to software O&M, comprehensive O&M service providers that are specialized across products, platforms, and applications are needed to integrate the upstream and downstream service ecosystems. They also need to be able to provide customers with end-to-end O&M services from infrastructure to platforms and upper-layer applications. In 2017, the market scale of third-party O&M services for IT data centers reached 79.22 billion RMB, accounting for 45.7% of the total market.

Huawei Launches the I•MOC Platform to address the O&M Transformation Trends

Over the past three decades, Huawei has served 50,000+ customers in 170+ countries and regions around the world. Huawei IT platforms have benefited a large number of customers, including organizations in industries such as R&D, sales, service, and finance. Huawei also has an amazing number of partners and hundreds of millions of terminal consumers around the world. Handling such a wide range of business processes posed great challenges to Huawei's IT systems.

To tackle these challenges, Huawei IT platforms began its cloud-based transformation in 2014. After several years, as the scale of Huawei IT cloud platform grew dramatically and the services became more diversified, Huawei entered an all-cloud era. Currently, Huawei is managing 200+ data centers, 50,000+ cabinets, 300,000+ servers, 1,000+ PB of data, millions of virtual machines (VMs), and several heterogeneous cloud environments.

How does Huawei overcome the difficulties and challenges in the digital transformation

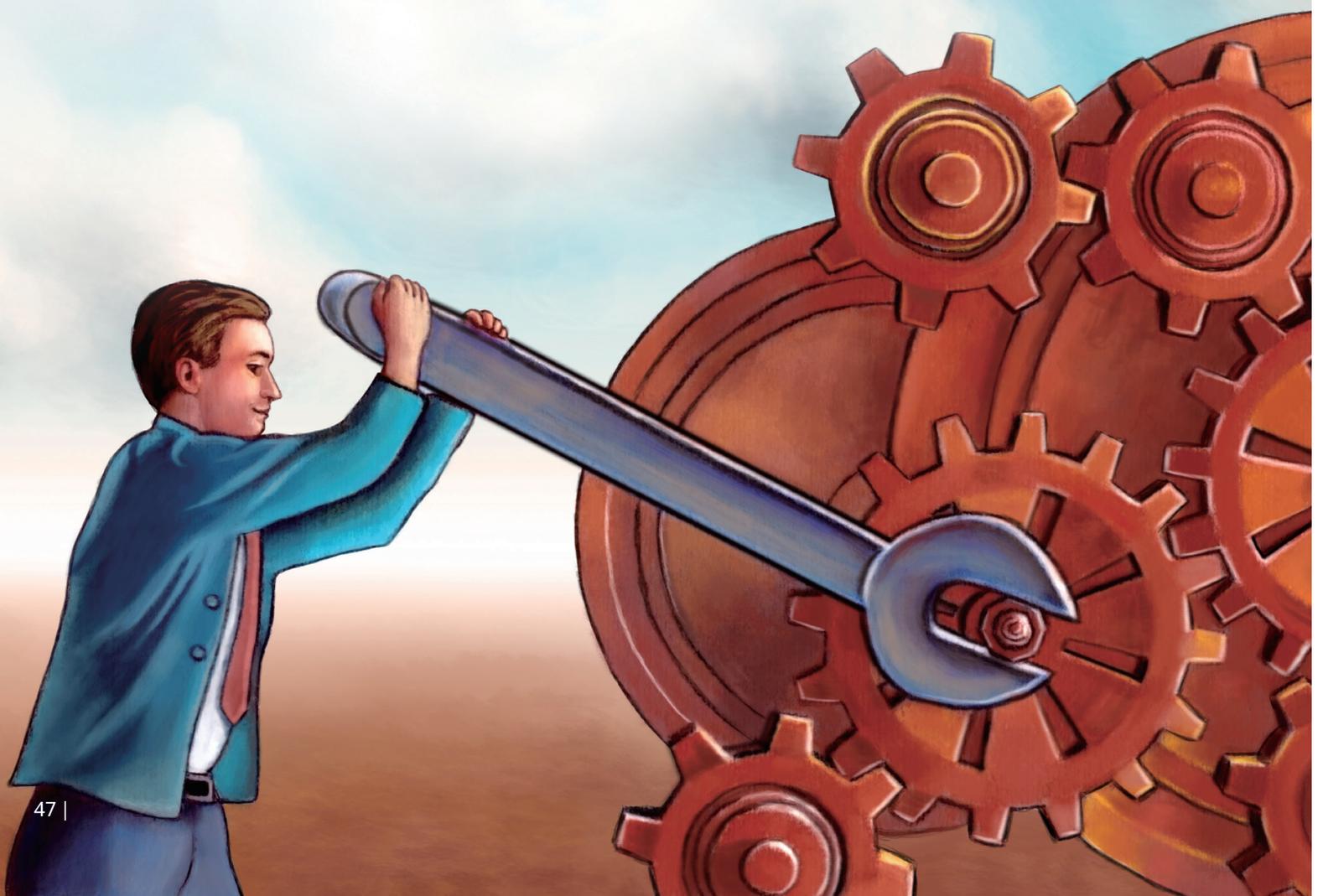
of IT systems? Huawei, leveraging decades of self development and practical experience, launched the I•MOC platform, a unified O&M platform that provides core functions including the management, monitoring, control, service, operation, and multi-tenancy. The management function registers all resources in a unified manner. The monitoring function provides real-time running status of resources. The control and service functions handle O&M problems. The operation function visualizes the usage, running status, and health of all assets and resources to help O&M personnel get an overview of the situation and quickly solve problems. The multi-tenancy function performs tenant isolation, permission management and control, and authentication authorization ensures platform security.

Huawei officially launched the unified O&M platform I•MOC for global enterprises at HUAWEI CONNECT 2018. By sharing Huawei's successful practices in automated and intelligent O&M, Huawei aims to help customers implement comprehensive and refined O&M processes and automate O&M tasks, providing customers with a visualized, intelligent, and easy-to-use operations experience.



ServiceTurbo Cloud: A Competitive Tool Platform for Enterprises in the Tool-driven Era

By Xie Zikai, Marketing Manager of ServiceTurbo Cloud Tool Platform, Huawei Enterprise BG



As a Chinese saying goes, "It is better to start making nets than merely coveting fish in the water." It is the use of tools that sets humanity apart from other animals.

History has shown that tools were used at each stage of human evolution, from Australopithecus to Homo habilis, Homo erectus, and Homo sapiens. Australopithecus could use natural items as tools but could not make tools. Hominids later evolved into Homo habilis, who could make simple stone tools. Homo erectus was our first ancient ancestor who could walk upright. This stage of human evolution freed our hands to do other tasks such as developing stone tools for various uses. After Homo erectus, the new species Homo sapiens learned to make fire and crafted stone and bone tools. Every stage of human evolution is closely related to the development of tools. By creating and using tools, humans were able to adapt to various environments, and we were no longer solely dependent on evolution. For example, humans do not have sharp teeth or claws for hunting, but we can make tools such as bows and arrows. Today, the emergence of new tools continues to change the way people

live and work. New tools are improving our speed and efficiency. Increased speed allows cost barriers to be broken through, and efficiency gains are impacting profit distribution modes. The new tool revolution is reshaping people's conception of time and of their capabilities.

With the rapid development of big data and cloud technologies, enterprises that are in the process of globalization are facing unprecedented challenges in communication network planning and design, quick device deployment, and automatic detection and warning of faults.

How should enterprises respond to these challenges? The traditional method has been to depend on experts who play a central role. However increasingly, they are unable to meet enterprises' expectations. In addition, the costs of recruiting such experts on the open market continue to increase. Therefore, enterprises are turning to intelligent tools, which are becoming a more reliable way to manage these challenges.

Huawei has developed ServiceTurbo Cloud, a unified cloud platform that integrates a large number of standalone tools. This platform provides interconnections and has

custom interfaces that industrial partners need, to build a sharing ecosystem. Some features have been applied and verified in over 100 global projects.

An Open and Unified Platform with a Tool Application Market and an API Market

Traditionally, the large number and various release channels of enterprise service tools lead to high costs in tool acquisition and learning. Huawei's ServiceTurbo Cloud, is a unified portal for enterprise service tools. It integrates enterprise service tools by industry, professional service, and product, providing one-stop tool services. Users can log in to the platform to obtain all of the tools.

ServiceTurbo Cloud is designed to be open. This platform has an open tool application market and an open application programming interface (API), providing both one-stop tool application services and application integration interfaces for partners to share technologies and integrate services. Huawei is committed to furthering its cooperation with partners on the ServiceTurbo Cloud platform, and continuing to provide better digital transformation services for customers.

The screenshot displays the ServiceTurbo Cloud interface. At the top, there is a search bar with the placeholder text "Enter the keyword of the tool name" and a "Search" button. Below the search bar are several filter tabs categorized by "Industry", "Professional Service", "Solutions", "Product", and "Status". The "Professional Service" tab is currently selected, showing sub-categories like "Design", "Implementation", "Technical Support", etc. Below the filters, a section titled "Tool Application (29)" displays a grid of tool cards. Each card includes an icon, the tool name, a star rating, a score, the status (Online/Offline), and usage times. The tools shown are: WLAN Planner (3.9 Scores), Agile Campus Network... (3.2 Scores), HCS Designer (4.7 Scores), IP Data Center Network... (5 Scores), SDN Data Center Network... (4 Scores), and Network Product Comp... (4 Scores).

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ServiceTurbo Cloud: A Competitive Tool Platform for Enterprises in the Tool-driven Era

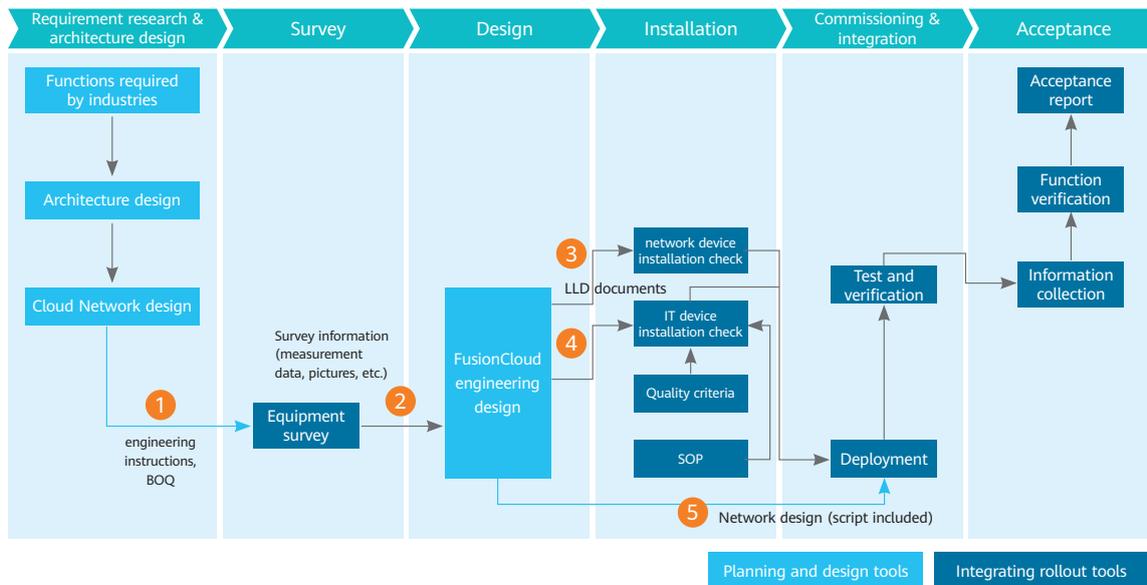


Streamlining Data Flow and Reducing Manual Data Conversion to Facilitate Data Sharing Between Different Operation Phases

In the past, enterprise service tools were separate from each other. Service data was not centralized, and data transmission was not available during the delivery phase. ServiceTurbo Cloud streamlines tool services and data, and supports data sharing between different operation phases, to form an aggregated tool chain. Take the development of FusionCloud+ADE tool chain, as an example, to demonstrate the transmission of service data between the different phases. The service flow and data flow are shown

in the diagram below:

Based on the unified technical architecture and data foundation, the ServiceTurbo Cloud platform facilitates smooth operations of service flow and data flow, it achieves seamless interconnection between these two flows, implements scenario-based tool chain operations, builds intelligent analysis capabilities for engineers, and helps them continuously accumulate experience.



Contributing to a More Intelligent O&M Process

ServiceTurbo Cloud: <http://serviceturbo-cloud.huawei.com>

The ServiceTurbo Cloud platform includes functional modules such as the operation, management, monitoring, control, and services, thereby providing more efficient data support for troubleshooting. It also provides an end-to-end (E2E) real-time multidimensional view and analysis at the service and user level. Its wizard-based query and mining views are used to help operations and maintenance (O&M) personnel quickly obtain data, securing services and supporting decision-making. The O&M data obtained after performing in-depth mining will become a new engine for carriers' development.

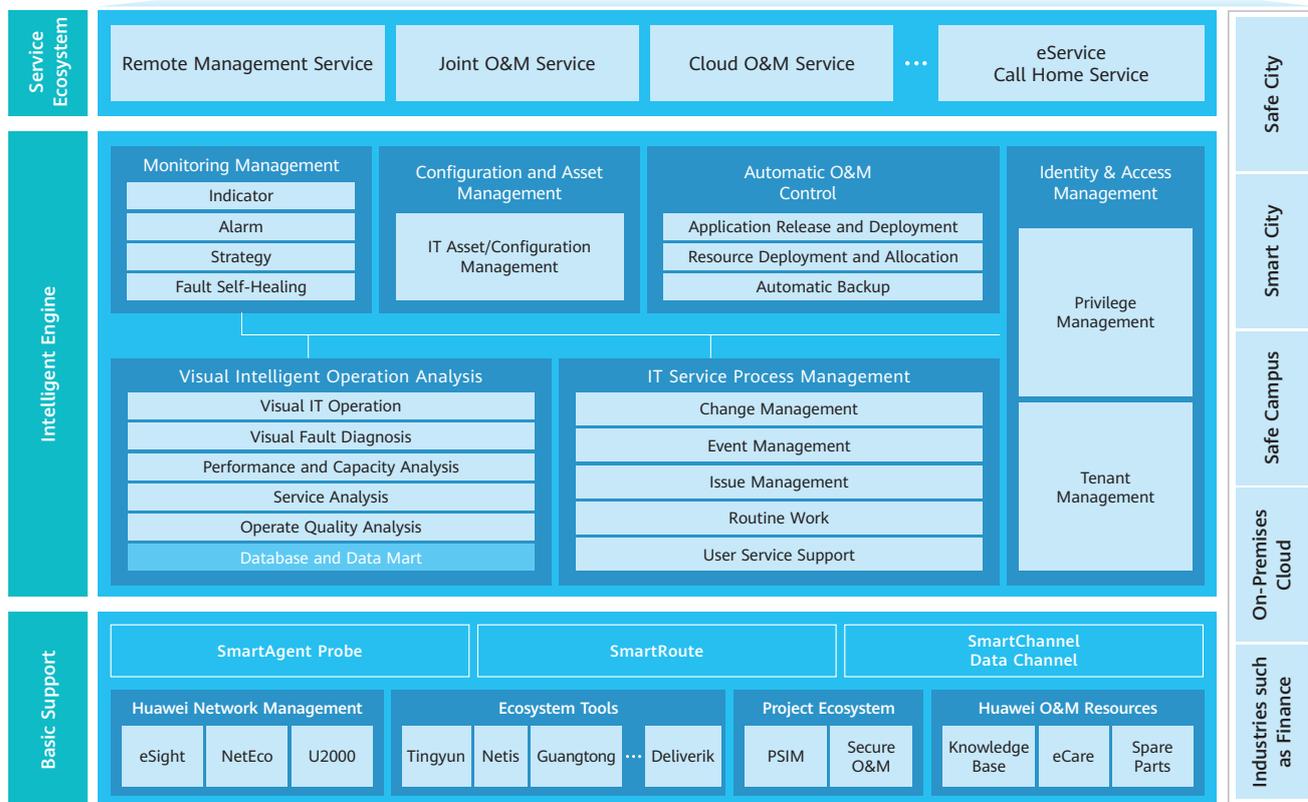
New services, technologies, and models are emerging during the digital transformation. It is imperative to have a platform that aggregates the capabilities of all our partners in the ecosystem, in order to accelerate the rollout speed of new services.

Huawei Enterprise Services formulated the ServiceTurbo Cloud enterprise service tool cloud platform based on its years of experience and accumulated expertise. It provides one-stop services for engineers working for Huawei, customers, and partners.

So far, ServiceTurbo Cloud has launched 80 tool applications and established over 1,300 valid projects. It has more than 5,000 active users on the platform. For example, in a wired and wireless integration project for a co-working environment of Company H, engineers used the WLAN Planner to plan and design the wireless network, developed a standardized design report, and used the ServiceTurbo Cloud Agile Campus Network Planning and Design Tool to generate a networking plan. The overall efficiency was improved by 75% and the result was highly acclaimed by the customer.



Customized O&M Portal



Observations

Building a Unified Government Big Data Platform, Lanzhou New Area Releases Digital Transformation Dividends

By Shen Siji, Shen Yao's Scientific Observation



In August 2012, Lanzhou New Area (LNA) became a state-level new area, the first state-level new area in northwestern China, and the fifth in the country. This modern new area, featuring industry-city integration, has begun to take shape over the past six years. LNA is now the engine that leads social and economic development, reform, and innovation, plus serves as the gateway for access to Gansu Province.

LNA is now building a government big data sharing and exchange platform for government information resource integration and data services, such as data sharing and exchange. This platform will connect information silos and achieve inter-city interconnection. In this way, the data is "running errands" for the citizens. Lanzhou New Area Science & Technology Culture Tourism Group and its wholly owned subsidiary, Data Investment, play a major role in project construction. This project will greatly improve the quality

and efficiency of government services, and has important strategic significance for the informatization development, government model transformation, and innovation of LNA.

The 13th Five-Year Plan for e-Government Development has specified to "guide e-Government development with a network-based strategy", which means to manage a "big system", share "big data", and build and use a "big platform" in a collaborative and unified manner. In this way, using big data to promote economic and social transformation has become social consensus.

LNA invited Huawei to establish a new, big data-based service model, due to Huawei's experience in developing and using government big data. This will undoubtedly improve administration, people's livelihood, and industry development. This service model will also be a reference for other governments to implement a big data strategy and develop a digital economy.



Success Stories

Building a Unified Government Big Data Platform, Lanzhou New Area Releases Digital Transformation Dividends

Breaking Siloed e-Government Construction

As an industrial base and transportation hub, LNA connects the east and west.

As a significant location on both the Silk Road Economic Belt and the New Eurasian Continental Bridge, LNA has irreplaceable geographic advantages.

LNA is one of the National Smart City Pilot Cities, Information for Public Well-being Pilot Cities, first batch of Information Consumption Pilot Cities, and e-Commerce Demonstration Cities. LNA is the first state-level new area in northwest China, and great importance is realized due to its strategic location and Smart City construction.

LNA has limited capabilities in constructing its own information-based infrastructure. Most governmental agencies have no equipment room, which led to limited network coverage. Lacking proprietary applications and information-based systems, many governmental agencies used state-level or province-level information systems when processing key service information. These systems could not be customized to meet local requirements.

An additional challenge was that parts of the government's data was not stored locally, and various agencies built their systems separately. Information systems of different government agencies were not planned and developed in a unified manner, impeding cross-agency data sharing and limiting efficiencies. Services that involve multiple agencies or departments could not be processed smoothly.

- » Aware of these deficiencies, LNA urgently needed a unified government big data platform. The party working and administrative committees of LNA specified the requirements for constructing a government big data platform.
- » To realize government information resource sharing, the platform must be able to support cross-departmental, cross-regional, cross-level, cross-system, and cross-business services. Additionally, the

platform should be able to support a city ecosystem, featuring full-process, full-coverage, full-model, and all-response intelligent management and service.

- » The platform should generate standards and systems for government openness and information sharing. This includes building a catalog system, improving standard systems, regulations, and laws, and establishing evaluation, exam, and security review systems.
- » The platform must support the interconnection of government information resources, which means to connect sharing and open platforms to the national e-Government network, so as to realize data concentration, sharing, and integrated management.
- » The platform must have flexible, open service support capabilities. The platform provides LNA with resource management and service capabilities to centrally collect, store, analyze, and compute various government data resources. It must also support public information resource sharing, exchange, integration, and services.

LNA hopes to leverage the platform to coordinate and share data resources, realizing cross-departmental service collaboration and efficiency improvements. On this basis, LNA can implement the objectives of the "streamlining, delegating, and optimizing" reform, and the service principles of "letting the data run errands for the citizens".

Establishing a Unified Government Big Data Platform

The Data Investment of New Area Science & Technology, Culture, Tourism Group worked with Huawei to plan and develop a government big data sharing and exchange platform. Combining Huawei's experience accrued from over 500 success projects, and the basic network and ICT-based construction in LNA, Data Investment and Huawei produced a future-proof platform

deployment solution.

- » In the data governance phase, Data Investment and Huawei built data governance tools, such as data integration management, quality evaluation and improvement, cleansing rules, and management and convergence, in LNA.
- » In the data migration phase, Data Investment and Huawei followed the standard of the government-based logical data model to build the city data resource library. The two companies established a data model for the LNA. This included building a data buffer, a source area, an integration area (the basic library), and themed, historical, and non-structural databases, and implementing installed base data import into the library, as well as incremental data import through an automated scheduling process, so as to support smooth data migration and exchange.
- » In the data support phase, Data Investment leveraged Huawei's proprietary big data service solutions to develop a support system on the LNA government's platform. The system supports the reliable, stable, accurate operations of the platform.

Huawei played an important role in constructing the LNA government's big data platform. It enabled the platform to collaborate and integrate the service process, unified the data model, and ensured intelligence development. Huawei also supported the sustainable, on-going evolution of the architecture. LNA now has a unified big data platform which serves as the foundation of a data-driven modern government.

LNA Releases Digital Transformation Dividends

Constructing the LNA government big data platform has improved the quality and efficiency of the service-oriented government. It has brought value and



strategic significance to informatization development and government model transformation in LNA. Our observations focus on the following three dimensions.

- » The LNA government big data platform has set a benchmark in e-Government resource centralization and security management.

Constructing a unified data platform can reduce the government's one-time investment, which has become an inevitable trend for e-Government compact construction. In this project, Huawei fully utilized cloud computing that features on-demand use and dynamic expansion to provide computing, storage, and information resource services for all departments in LNA. Huawei implemented centralized deployment of software and hardware, unified construction and sharing, and information sharing. This avoided repeated investments in hardware and software, and data collection and input, realizing resource centralization at multiple layers. In addition, key service systems and data are now managed and maintained in a centralized and efficient

manner to support the security and reliability of the ICT-based system.

- » The LNA government big data platform has improved the government's efficiency and quality, reduced management costs, and promoted service collaboration.

Different from the traditional government model, the LNA government has improved its efficiency, reduced management costs, and simplified service handling processes by using the big data sharing and exchange platform. The government has fundamentally transformed from a management-oriented government to a service-oriented government which provides benefits and convenience for citizens.

- » The LNA government big data platform will lead to the development of a service-oriented government and digital economy.

LNA has developed a unified information platform, which supports extensive information resource service capabilities. The platform can provide comprehensive information resource services, enabling LNA to develop a new,

innovative service model to improve the administration, people's livelihood, and industry development. The platform promotes the government to realize digital transformation, prepares the city for Smart City construction, boosts regional industry upgrade and evolution, and assists LNA in releasing digital transformation dividends.

As a leader in the government big data field, Huawei has extensive experience and technologies in constructing government data platforms within China. The government big data platform, jointly launched by Huawei and Data Investment, has set a benchmark and become a sample in government big data platform construction. It can be promoted and replicated across China to construct a new level of government big data.

Success Stories

Implementing e-Government Cloud, Huawei Tackles Two Difficult Problems with Its Advantages in O&M

IT management services, from asset management to CMDB construction, to standard operations of O&M, and the eventual realization of automatic and intelligent O&M, is the evolution direction of Huawei government cloud operations. In 2017, International Data Corporation (IDC), ranked Huawei's e-Government cloud first in China. Huawei customizes its e-Government cloud to continuously meet customers' needs. Huawei's e-Government cloud not only meets security and stability requirements but also allows service upgrades during O&M. Huawei has successfully implemented the e-Government cloud. >>

Implementing e-Government Cloud, Huawei Tackles Two Difficult Problems with Its Advantages in O&M

By Zheng Kai, PPtech

Government services are migrated to the cloud due to various features. While government services bring tangible benefits and improve the public's well-being, there are limits on these services due to public concern. The cost and efficiency also affect the process of migrating government affairs to the cloud.

Cloud computing has overwhelmingly changed O&M and business models for enterprises. The O&M of e-Government cloud is a typical example. Due to its limitations, most governments cooperate with carriers instead of building their own O&M teams. Carriers have extensive experience in traditional data center O&M, however, they lack experience in cloud data center O&M.

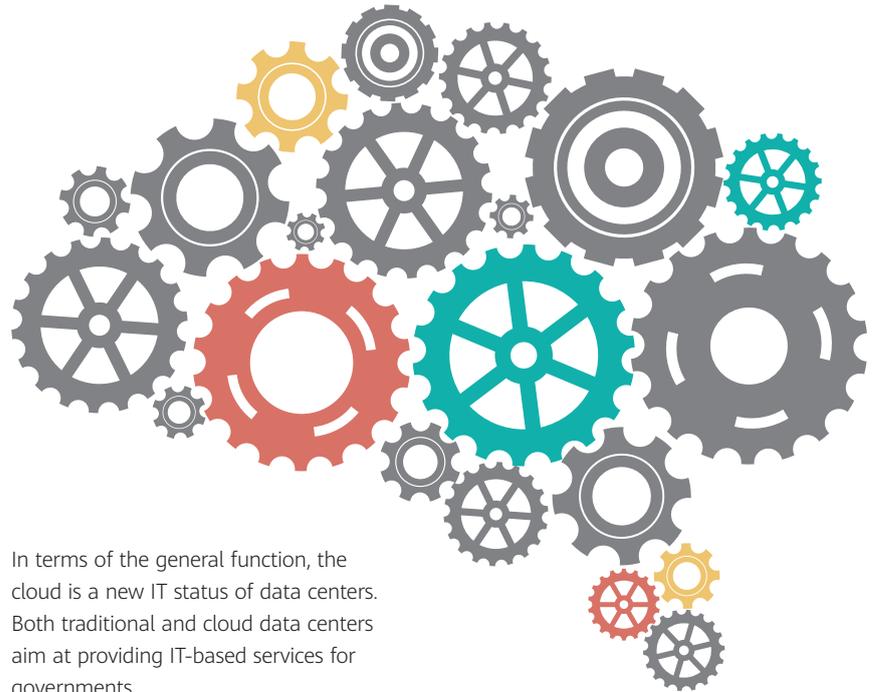
Carriers are now migrating their services to the cloud, while also being responsible for local e-Government cloud O&M. During this process, complicated problems can occur. Encountering such difficulties, Shanghai e-Government cloud leveraged Huawei's extensive experience in O&M. What are the results of the cooperation?

Shanghai e-Government Cloud Encountered Typical O&M Difficulties

China experienced a "golden age" of e-Government construction soon after entering the Internet era. From 2011 to 2015, e-Government construction developed rapidly and reached a peak time, however, data centers were built with no coordination. No unified plan led to low resource usage efficiency and difficult O&M.

The e-Government cloud supports the next-generation of data services and sharing, addressing the various problems related to developing e-Government. Within these conditions, governments nationwide are eager to develop their e-Government cloud.

The differences between traditional data centers and cloud data centers are as follows.



In terms of the general function, the cloud is a new IT status of data centers. Both traditional and cloud data centers aim at providing IT-based services for governments.

In terms of O&M objects and service content, cloud data centers are different from traditional ones. Taking the IaaS layer as an example, O&M objectives of traditional data centers include physical resources, such as equipment room infrastructure, network and network equipment, server, and storage products. In addition to these physical resources, cloud data centers O&M objectives also include virtual resources established on the infrastructure, such as network resources, computing resources, storage resources, and the virtual platform.

Cloud data centers transform IaaS into services, and provide these services for customers. Cloud data centers leverage technologies, such as virtualization and SDN, to put all resources, such as network, computing, and storage, into a resource pool, and automatically allocate these resources to customers based on their needs.

The development of cloud services will transform carriers' operations model from selling resources to selling services and capabilities. This transformation changes O&M organizational structure, resource allocation, and O&M processes. Carriers

choose Huawei to customize a cloud center O&M planning and design solution, collaboratively supporting the Shanghai e-Government cloud project.

Huawei Breaks Down Challenges and Tackles Problems One by One

Although all e-Government cloud projects have similarities, every project has its own characteristics. The solutions to customize the Shanghai e-Government cloud project were not easy. Huawei's experience and professionalism ensured that a successful O&M program was built.

The challenges were as follows.

After elaborate analysis, **the first challenge was to confirm whether the customer's existing tools could meet O&M requirements.** With a limited project budget, the customer hoped to use existing tools to implement O&M. Therefore, the project team needed to fully understand the functions of the customer's O&M platform, to customize the applicable part. Determining whether these tools and services could be interconnected with the cloud platform was a critical problem.

Success Stories

Implementing e-Government Cloud, Huawei Tackles Two Difficult Problems with Its Advantages in O&M



After objective live network evaluation, **the second challenge was to customize an O&M organizational structure, a management process, policies and regulations, and SOPs based on the e-Government cloud and Information Technology Infrastructure Library (ITIL) standard and framework.**

The design of an O&M organization architecture is not easy. Adopting a step-by-step model, Huawei first developed a standard O&M model, and then customized it based on characteristics of the customer's business, and even simplified the structure after it was put into use. In the early stage, on-site troubleshooting was not available due to limited capabilities. With the increase of the service volume, responsibilities of different roles were specified based on the workload, to eventually develop a highly efficient organizational structure.

A step-by-step deployment was not enough, Huawei continuously optimized the process, regulations, and SOPs in actual operations. Lacking tools to support the process, Huawei suggested the customer form a standard operations process among on-site personnel, and then migrate the standard process online when tools and the platform were well developed. During the early stage of operations, only a few problems occurred. On-site personnel communicated over phone or WeChat for higher efficiency, and then collected and recorded any issues on paper worksheets.

“

Huawei's customized, professional services included developing internal procedures, establishing teams, producing methodology, and continuously optimizing the process based on customer requirements. During this process, Huawei broke down and resolved various problems one by one, which showed its professionalism and maturity.

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Summarizing the Experience Gained in the Shanghai e-Government Cloud Project, Huawei Has Produced a Complete Cloud O&M Methodology

An e-Government cloud has unique characteristics when compared to other cloud services, e-Government cloud O&M focuses on business support. New e-Government cloud services grow slower than other Internet services that feature fast iteration. e-Government cloud development prioritizes security, management and performance. In addition, an e-Government cloud normally has hierarchical management requirements and focuses more on the potential value of data.

Huawei has summarized the experience gained in the Shanghai e-Government cloud project and produced a four-stage process of e-Government cloud O&M.

Stage 1: the preliminary stage

Focus on asset management. The O&M in this stage is to perform troubleshooting. No dedicated receptionist and management position were available. Therefore, the first task is to visualize resources by implementing integrated surveillance to monitor computing, storage, and network resources in the virtual resource pool. This allows for problems to be detected and resolved in a timely manner.

Stage 2: the basic construction stage

Develop a CMDB based on the integrated surveillance. CMDB implementation results will directly impact O&M efficiency and costs. The CMDB should be planned with a long-term perspective while deployed by level and by stage. Huawei believes that in the early stage, logic relationships can be added to IT assets. The granularity does not need to be too specific, which will cause difficulties and higher costs during O&M and reduce O&M efficiency. The CMDB construction is the best method to show organizational O&M capabilities.

The Shanghai e-Government cloud project involved a small number of configuration items (CIs). All models were newly deployed. The service application volume

grew gradually, and service management relationships were not well-developed. Under this circumstance, enough time and space were provided for CMDB modeling and deployment. Since the O&M organization model was still immature, the O&M process focused on resource application, distribution, and fault handling. Advanced functions can be developed until the organization becomes more mature.

Stage 3: the standard operations stage

When the CMDB construction is more mature and the granularity meets routine requirements, the ITIL O&M process system can work effectively, and the value of resource application, event, problem, change, and release can be truly realized. In this stage, the O&M organization model is mature enough, and the service volume is high. Standard operations can effectively improve O&M efficiency.

Stage 4: the automatic and intelligent stage

In this stage, more tools are required to support O&M. Work in this stage focuses on customizing tools and then matching them to services. This stage marks the successful implementation of an e-Government cloud O&M project.

At the end of 2017, IDC ranked Huawei first in developing the e-Government cloud within China. This methodology demonstrates that the development of Huawei's e-Government cloud product strictly follows customer requirements with clear planning. Huawei's products not only meet the requirements for security and stability, but also support service upgrades during O&M. Eventually, Huawei has successfully implemented e-Government cloud.



High Optical Fiber Performance Supports the Spread of Huayin Opera

By Zhang Ge

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Huayin Opera is regarded as an early precursor to rock and roll. It originated in the Loess Plateau region of China. In the 2016 CCTV Spring Festival Gala, the Singer Tan Weiwei and Huayin Opera artists performed "The Sound of Huayin Opera." The song is the perfect combination of pop culture and traditional art. Rock and roll is not about "three chords and a tough and insistent drumbeat". It is about freedom from routines and doctrines. The resounding chorus of "The Sound of Huayin Opera" moves the audience so much, it often moves them to tears. Tan Weiwei is a proud singer who's devoted to music.

While it might not quite move you to tears, O&M service has a lot in common with rock and roll. The methodology of "evaluation - optimization - improvement" proposed by Bai does not follow any predefined rule, but the result is always as exciting as "The Sound of Huayin Opera".

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Everything in life could be music.

Sitting in front of me is a senior rocker named Bai. Of course, it bears mentioning that, in addition to being a rocker, he is also one of the best network evaluation and optimization experts in the industry.

For Bai's generation, everything in life could be music, such as a brick or a bench. Ask Bai any professional question, and he'll begin by referencing rock and roll. "After the generation of the Tang Dynasty band and Black Panther, Tan Weiwei is the only rock and roll singer in China that deserves my attention." Then he continued on talking about Tan Weiwei.

I didn't have all day. I just wanted to know the relationship between Huayin Opera and network evaluation and optimization. I wanted to learn some methodologies from Bai. After a bit, he turned to the main topic. Of course, it was just the prelude.

The song Tan Weiwei performed at the Gala has rich cultural references from the Shaanxi area. The song was first performed on the stage of "China Star." Tan Weiwei collaborated with five Huayin Opera musicians who were over 70 years old and who interpreted China's oldest rock and roll music. The performance moved both the judges and the audience.

"The 2016 CCTV Spring Festival Gala had 1.03 billion viewers. The line O&M pressure was high. That year, the Shaanxi Broadcast & TV Network was in charge of the live broadcast from the Gala's separate studio in Xi'an. To ensure

the broadcast of the 2000-year-old Huayin opera went smoothly, the provincial backbone OTN network needed to run stably and at optimal performance. Additionally, at midnight, the five separate studios and the main venue in Beijing would collaboratively perform a song," said Bai.

Backbone network and "Sunflower"

To be honest, Bai is more likeable when he starts talking about ICT. As a senior service expert, he often discusses topics that also have some historical background that the younger generation, myself included, are unfamiliar with. "The provincial backbone transmission OTN network of the Shaanxi Broadcast & TV Network was built in 2011. That year, the rock star Wang Feng released an album called Life Asks for Nothing. The track Sunflower was pretty good. That year, several western-style underground rock bands were also established." He was off the topic again and I had to interrupt: "Can you tell me more about the OTN network?"

"The Shaanxi Broadcast & TV Network was the first provincial broadcast and TV network company in China to implement unified planning, construction, management, and operation of the provincial broadcast and TV network. The OTN network carries important services such as provincial TV broadcasts, HD VOD, and VIP private line services. It is the most basic and important bearer network of the Shaanxi Broadcast & TV Network, and it plays a decisive role in the operation of the company's entire service." Bai said.

Success Stories

High Optical Fiber Performance Supports the Spread of Huayin Opera

Optical fiber can also get rusty.

"A good song can always stay untouched by the ravages of time, but even the most advanced fiber network will get worn out after a long period of time. Although I did not participate in the project, I still know a lot about it. After a network is constructed and put into use, the network performance gradually deteriorates because of frequent cutover and natural aging of the optical cables. The optical power deviation will become too large, and this causes the cable's channel performance index to fall below the qualified level. Degraded optical cables cause service interruptions. Earlier, the maintenance pressure had already become huge during the live broadcasts of important activities, such as the parade commemorating 70th anniversary of the victories of the World Anti-Fascist War." Bai said. (The "World Anti-Fascist War" is how many people of Bai's generation refer to World War II.)

I asked: "Who won the bid for the network optimization and reconstruction service?"

Bai said: "Huawei did."

I asked: "How?"

Instead of answering my question immediately, Bai talked a bit about some of the implementation details of the project. "Huawei has comprehensively evaluated the Shaanxi Broadcast & TV Network's provincial backbone OTN network. It covers four modules: network performance, network resources, network O&M efficiency, and network reliability. There were 14 sub-items in total. Among them, it was proposed that the two sections from 'Yan'an to Yulin' and 'Weinan to Zichang', should be thoroughly optimized, due to serious performance degradation".

"Huayin is located in the Weinan area, and Huayin Opera has its roots their local musical traditions. Weinan people are famous for their boldness and frankness. If the Gala broadcast had become unstable, can you imagine their reaction"? Bai had another sip of his tea.

Quality content

It seemed that sipping tea made Bai very excited. After my repeated demands, he finally got into some meaty technical details. "Huawei improved the overall performance by replacing the optical amplifying boards and reconstructing the site types. We optimized the system parameters for other spans on the entire network to ensure that the optical power and single-wavelength flatness of the main line reached the standard, and thereby improved the network performance and single-wavelength performance. After the network optimization,

the overall network performance was improved by more than 30%. Therefore, I think Huawei has demonstrated its service capability through network evaluation". However, software commissioning optimization and hardware optimization are the true highlights of the project.

"Of course, when a good musician arranges a song, he or she doesn't focus only on the musical instrument or the matching of tunes. Music is not simply about the sound effects created by computer hardware and software." Once again, he was off the topic. "What's the



relationship between musical arrangements and O&M services?" I asked, to steer him back on topic again.

Another highlight of this project was that it also helped customers transform their O&M modes, just as Tan Weiwei's rewriting of the song gave Huayin Opera a new life.

Previously, a severe flood occurred in Yulin, causing multiple fiber cuts. It was difficult and time-consuming to locate the fiber faults. To address this issue, Huawei implemented the premium WDM service solution, and deployed premium WDM for

14 sites (covering three cities: Xi'an, Weinan, and Xianyang). This solution helped customers quickly locate the fiber faults within minutes, and monitored optical-layer performance in real time, thereby helping customers implement intelligent O&M and improve the O&M efficiency.

A rocker that gets old

At this point, Bai finished his answer, and I had no more questions to ask.

Bai loves music and O&M services

equally. Before we said goodbye, he asked me to listen to "The Sound of Huayin Opera" with him. Listening to Tan Weiwei and the other veteran artists, it was easy to hear that rock and roll is not merely "three chords and a tough and insistent drumbeat". It is about freedom from routines and doctrines. In this regard O&M service is also like rock and roll. The methodology of "evaluation - optimization - improvement" proposed by Bai does not follow any rule, but the result is always as exciting as rock and roll.



Robust Ecosystem

From Ivory Tower to Lighthouse: Exploration of School-Enterprise Cooperation Models for Talent Development

Talent development is key to achieving the long-term development of a country. Talent development must be forward-looking. History provides us with an abundance of examples of how the emergence of outstanding talent can greatly contribute to the development of a nation and a people. The information communications technology (ICT) industry, which features technologies such as cloud computing, big data, Internet of things (IoT) and artificial intelligence (AI), has become a strategic industry for national economic and social development. The shortage of ICT talent has become a bottleneck that is hindering industrial development. It even affects the sustainable development of the overall economy. >>

From Ivory Tower to Lighthouse: Exploration of School-Enterprise Cooperation Models for Talent Development

By Li Jisheng, Director of Brand Communication, Huawei Talent Ecosystem Development Dept

A Huge ICT Talent Gap that Calls for School-Enterprise Cooperation

In 2017, there was a total demand gap of over 7.65 million ICT graduates. As this gap widens, challenges in talent recruitment, structures, and business capabilities are increasing. Moreover, ICT talent development suffers from problems such as a mismatch between the location where talent is produced and it is needed, and misalignment between the current and ideal talent pool and levels. These misalignments plague the entire ICT industry. As for ICT talent development in China, the problem lies in the fact that many graduates cannot meet employers' requirements. An innovative model of school-enterprise cooperation and industry-education integration is a potential solution. In this model, higher education institutions share resources with enterprises and set development targets based on the demand for certain skills. The ICT industry is expected to see an increase in innovation and entrepreneurship. Higher education institutions and students can focus on productive skill development. Overall, this model contributes to a healthy ICT talent ecosystem, which in turn fuels steady industry development.

Bottlenecks in School-Enterprise Cooperation and Industry-Education Integration

The development of school-enterprise cooperation is motivated by the development requirements of higher education institutions and enterprises, and accelerated by favorable governmental policies. However, it has entered a

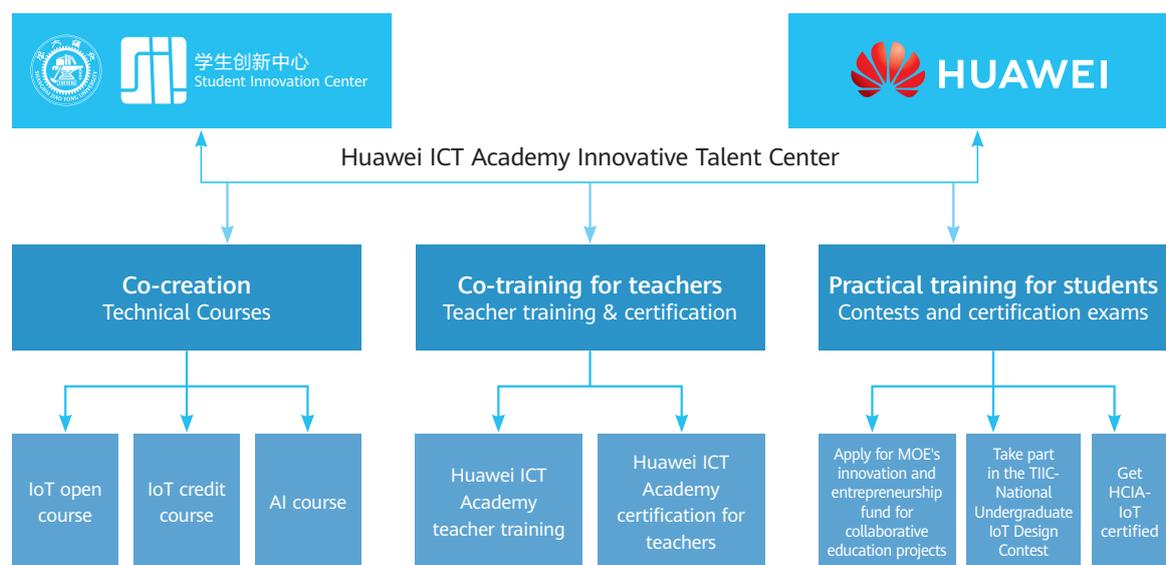
more difficult phase in which crucial problems remain.

The model remains inchoate, the cooperation between schools and enterprises is not well-established, and lacks systemic organization. Some enterprises are reluctant to cooperate with schools, because they often emphasize theory over practical skills. This leads to a mismatch between courses taught in schools and professional qualifications required by employers. In addition, lack of enthusiasm on the part of professors and students often hinders cooperation projects.

Mutually Beneficial Collaboration for New Talent Development

As a leading global ICT infrastructure provider, Huawei fosters an open, shared, and mutually beneficial ICT talent ecosystem. In 2013, Huawei ICT Academy, a school-enterprise cooperation project, was launched to help build Huawei's talent ecosystem.

In January 2017, the Student Innovation Center of Shanghai Jiao Tong University (SJTU) signed an agreement with Huawei to set up an ICT Academy. Based on its insights and in-depth experience in industry-education integration, Huawei worked with SJTU to develop a new school-enterprise cooperation model that introduces practical training into courses. The cooperation model focuses on specific research, and includes a project assessment system. In this new model, professors are trained by both Huawei and SJTU, and the results are demonstrated in competitions.



Robust Ecosystem

From Ivory Tower to Lighthouse: Exploration of School-Enterprise Cooperation Models for Talent Development



IoT Open Course

Co-creation of Practical Technical Courses to Remedy the Skill Mismatch in Higher Education

In recent years, the Fourth Industrial Revolution, characterized by cloud computing, big data, IoT, and AI, has brought huge challenges to the higher education industry. Schools urgently need to modernize the curriculum of traditional engineering majors. In addition, most emerging technologies are directly applied in industry, and schools therefore lack case studies that can be used for teaching. Even China's top universities suffer this problem.

Huawei Academy is working with the Student Innovation Center of SJTU to develop IoT talent. The course curriculum is designed by Huawei experts and professors based on the Huawei Certified ICT

Associate (HCIA)-IoT certification. Students will develop their knowledge by studying real projects and the effectiveness of their learning will be tested with experiments, thereby demonstrating their knowledge. The entire course focuses on practical cases and projects to counteract the weaknesses of higher education in this area.

Training Professors to Improve Teaching Quality

Huawei arranges training for SJTU professors. The Trainers will participate in teaching and instructing students throughout the course, and SJTU professors who hold Huawei certifications will be assigned to help other professors in learning and experiments. The training will



Huawei IoT Technology Teacher Training Course



ensure that SJTU professors understand Huawei's new IoT technologies and related practical skills, and improve the team's overall quality. In March 2018, the SJTU School of Electronic Information and Electrical Engineering (SEIEE) introduced Huawei's practical IoT training into its course "System Design Methods, Tools and Practice" for the information engineering major. Thirty students selected this 2-credit course requiring 32 training hours. The students' score on the HCIA-IoT Certification exam was worth 30% of their final grade. All of the students attended and passed the certification exam.

Encouraging Students to be Innovative, Entrepreneurial, and Competitive

At the end of the course, Huawei used a "program + presentation" system to assess students' learning effectiveness. The students were required to use the technologies they learned about and to work in teams to complete a project that involved solving a specific problem in one or two weeks. In December 2017, the first batch of students passed the assessment and created some 20 innovative projects. In June 2018, students who selected Huawei's IoT innovation course improved their course projects, and participated in the 2018 TIIC-National Undergraduate IoT Design Contest. Two teams of six students each won the Grand Prize of the Eastern China Region. In September, the two teams

both won the National First Prize, and five team members received recommendations for postgraduate programs because of the award. The course enables students to compete and gives them an opportunity to further advance their studies. This process enhances the course value and students' capabilities in innovation and entrepreneurship.

The school-enterprise cooperation between SJTU and Huawei is a beneficial exploration to help higher education institutions improve their curriculum and education model. Not only is the school-enterprise cooperation model recognized by SJTU, it is also recognized by other universities. This case has been widely discussed through various channels, and the methods are now being adopted by elite Chinese universities such as Tianjin University, Harbin Institute of Technology, Southeast University, Wuhan University, Yunnan University, and Beijing

University of Technology. The success has boosted the nationwide innovative upgrading of the talent development models in higher education institutions.

In the new era of ICT development, Huawei will not only accelerate scientific and technological innovation, but also invest more in knowledge innovation and talent development. Huawei hopes that furthering school-enterprise cooperation will better align school curricula and industry segments, course content, and professional qualifications. This will lead to improved teaching structures, production processes, talent development, and employment. By bridging the gap between enterprise demand and talent supply, Huawei provides more technical and capable talent, more advanced technologies, and more support for talent innovation and entrepreneurship. This facilitates a virtuous cycle and sustainable development of the ICT industry.



Huawei representatives and SJTU students at the 2018 TIIC-National Undergraduate IoT Design Contest

How Huawei Enterprise Services Work with Partners to Promote Transformation of the Digital Industry

By Wu Ningchuan (Cloud Time)



In a narrow sense, the value of the digital transformation market (related software and services) is expected to reach nearly 500 billion USD by 2022, according to US market research firm MarketsandMarkets. In a broad sense, the digital transformation market (hardware, software, and services) is expected to reach a total value of 5.9 trillion USD by 2021, according to US market research firm IDC. The digital transformation of enterprises triggered by social networking, mobility, cloud, big data, artificial intelligence, and the Internet of Things (IoT) is about the depth, breadth, and transformation intensity of enterprise IT, which exceeds the capabilities of one or even dozens technology suppliers.

For enterprises, digital transformation involves using ICT technologies to innovate and transform services, increasing service growth. IDC considers the following five aspects of enterprise digital transformation: leadership transformation, comprehensive experience transformation, information transformation, operation model transformation, and resource model transformation. All aspects of enterprises are involved, including enterprise customers, enterprise resource management (ERP), and production and manufacturing logistics. As pointed out by a number of advisory and market research institutions, digital transformation is disruptive transformation of enterprise organizational models and operational modes, which requires seamless combination of multiple capabilities and technologies.

Challenges are numerous, including properly leveraging digital transformation opportunities, meeting enterprise requirements across organizational boundaries, and seamless integration of old and new ERP systems with the

IT system. As one of the world's largest suppliers of digital transformation technologies, Huawei will fully leverage its platform advantages to drive the digital comprehensive transformation and upgrade of enterprises into the future. As a world-leading platform-level enterprise, Huawei launched ServiceTurbo Cloud, a cloud platform for enterprise service tools, and collaboration services for partners in the second half of 2018. Huawei works with partners to meet various enterprise digital transformation goals, ushering in a new era for digital transformation.

Digital transformation service capability platform

The platform economy is an important sector of the digital economy. The social cloud platform enables more participants to share skills, tools, and tasks. Additionally, it serves as a major Huawei service model for enterprise digital transformation.

Huawei divides the lifecycle of enterprise customer services into three phases: Plan, Build, and Run. To meet service and ICT practice requirements in different phases, Huawei Enterprise Service provides both Huawei-brand and collaboration services. Customers with high service requirements will be able to choose Huawei-brand services. Those seeking more cost-effective services can select collaborative services released by Huawei and its partners. With the release of the ServiceTurbo Cloud platform and Huawei collaboration services, Huawei and its service partners have formed a complete joint service capability platform.

	Government and public affairs	Manufacturing	Transportation	Energy and electricity	Finance
					
Professional services	32 types of planning and design <ul style="list-style-type: none"> FusionCloud6.3.1 & 6.5.0 planning and design ★ Agile campus network planning and design ★ ... 	21 types of integration implementation <ul style="list-style-type: none"> Storage product networking assistance Network product comparison tool ... 	21 types of technical support <ul style="list-style-type: none"> Enterprise network inspection Ecare ★ ... 	5 types of unified O&M <ul style="list-style-type: none"> RMS remote management I-MOC ★ ... 	8 types of performance improvement <ul style="list-style-type: none"> Phoenix platform KunLun TCO calculator ...
Product services	18 types of enterprise networks <ul style="list-style-type: none"> WLAN planner ★ eDesk ★ ... 	38 types of IT products <ul style="list-style-type: none"> Visualized LLD storage design Rainbow ... 	5 types of cloud core networks <ul style="list-style-type: none"> Cloud core network information center ... 	9 types of wireless enterprise products <ul style="list-style-type: none"> eLTE planning and design U-net ... 	3 types of network energy <ul style="list-style-type: none"> DC service experts ...

ServiceTurbo Cloud: 100+ tool applications, helping partners deliver services

Robust Ecosystem

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ServiceTurbo Cloud is an open one-stop service tool cloud platform, covering network, cloud core, wireless, network energy, and other product lifecycle services. The service tools involve network product tool eDesk and IT product tool eService/Toolkit. Targeting professional service scenarios such as planning and design, implementation, migration, maintenance, optimization, and O&M, ServiceTurbo Cloud provides professional service tools integrating different products, such as cloud DC design and network performance evaluation and optimization tools. It also provides operation tools that match industry service characteristics, such as Safe City IVS site design and Smart City eLTE design tools. ServiceTurbo Cloud is an end-to-end tool application market, integrating delivery platforms to form a tool chain. This not only streamlines data flow and reduces data conversion, but also makes enterprise service standardization possible with its "onsite + remote collaboration" delivery model.

Based on the ServiceTurbo Cloud platform, Huawei collaboration services first launch collaborative WLAN planning and design, engineering installation technical support, and collaboration management services. Consider collaboration management services as an example. Enterprise's IT O&M department still faces the following challenges: First, the IT environment still suffers several days of downtime each year. Second, IT staff still respond to problems passively. Third, IT enterprise management still depends on people instead of platforms and processes. Huawei collaboration management services provide remote technical support and a platform for service partners to monitor customer equipment and network health during

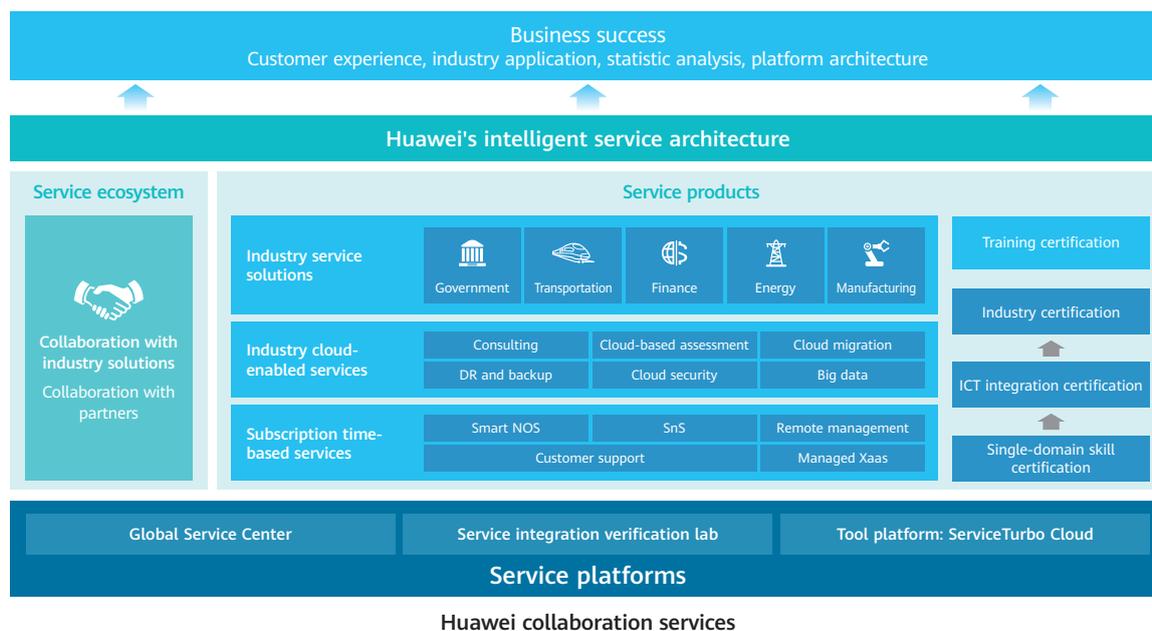
maintenance. This service helps service partners with system optimization suggestions, along with quick problem identification and resolution.

Digital enterprise transformation no longer fully depends on Huawei-brand services. After all, regional service providers have a better understanding of the culture, organization, and operation of local enterprises. With the help of Huawei's service tool cloud platform and joint collaboration services, regional service providers can provide services to different regions in depth and in detail, helping enterprises consolidate their digital transformation.

Collaborate with partners to promote digital transformation

Among Huawei's enterprise service partners, Qingdao Dorsary Information Technology Co., Ltd. (Dorsary) is one of the representatives with actively developed value-added services. Dorsary was founded in 2014. After only three years of development, it became a dual-gold-medal partner of Huawei in three cities in its province. Since its establishment, Dorsary defined its development direction as cloud computing, big data, and IT services. Its main business focuses on IT-related products such as servers, storage, and cloud computing. The company has partnered with Huawei.

To better serve customers, Dorsary has established a customer service center, which effectively relies on Huawei's R&D, professional service support, and troubleshooting capabilities. In addition, as the company has a wide range of personnel, it can provide flexible and quick onsite





support, help customers quickly locate and solve problems, and provide personalized services based on customer requirements. Dorsary has won recognition from customers in industries such as government, energy, transportation, and education. Dorsary's services cover 17 cities in Shandong and its surrounding provinces. The company has many experts and experienced project managers. Various professional technical personnel can effectively assist with customer support, project implementation and delivery, and after-sales maintenance services.

In September 2017, at the Huawei Connect conference, Huawei released their remote management service. Dorsary followed up immediately and collaborated with Huawei to promote the O&M service. The joint O&M service was designed for enterprise customers with insufficient personnel, providing fast service development and great O&M assurance. It provides visualized, data-based, specialized, intelligent, and proactive services. Huawei collaborates to provide original manufacturer services for difficult technical problems and Dorsary is in charge of providing services such as periodic inspection, fault location and detection, onsite emergency response, onsite service, and key event assurance.

Dorsary & Huawei joint O&M services help Qingdao NESI Group decrease their O&M personnel by over five. In addition, the group can still monitor the network for eight hours every weekday and on holidays. The previous challenges faced by NESI include no dedicated network maintenance personnel, no attendance during holidays, large numbers of cross-vendor devices (over 500), and insufficient IT personnel skills. In addition, troubleshooting, which was done passively, usually exceeded eight hours. Dorsary has developed a customized onsite + remote

+ evaluation and optimization service, with onsite + remote services ensuring stable network operation, and network evaluation services identifying network risks. The solution improves troubleshooting efficiency by 30% and identifies more than 30 potential risks based on in-depth understanding of network conditions.

As one of the six types of Huawei ecosystem partners, service partners have developed rapidly in the past six years. As of December 2018, Huawei has more than 3600 enterprise service partners and more than 30,000 Huawei-certified engineers. Huawei's enterprise service ecosystem is beginning to take shape. Service partner and Huawei teams have provided strong support for customer service delivery resources. In addition, Huawei's ServiceTurbo Cloud platform, three global service sharing centers, integration verification labs covering 50+ scenarios in seven countries, 12 OpenLabs, and Huawei's enterprise technical support website (Support-E) provide platform-level support for Huawei enterprise services and fully meet global enterprises' urgent demands for digital transformation.

2019 is a critical year for global digital transformation. According to a Gartner CIO Agenda survey in 2019, 49% of CIOs said digital transformation has changed their business models. The 2019 Gartner CEO Perspective survey shows that 69% of CEOs will change their business models between 2018 and 2020. Obviously, global CIOs and CEOs are pushing their enterprises toward the critical area of digital transformation. Providing partner collaboration management services and covering 1000+ Huawei and other mainstream products with 100+ tool components, the ServiceTurbo Cloud platform is undoubtedly an accelerant in enterprise digital transformation.

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