

ICT INSIGHTS

Huawei Enterprise

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LEADING NEW ICT

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To subscribe to *ICT Insights*, contact the Editorial Board.
Email: ICT@huawei.com
Address: H2, Huawei Industrial Base, Bantian, Longgang,
Shenzhen 518129, China
Tel: +86 (755) 28780808
+86 (010) 82882758



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Publishers: Heng Qiu

Advisors: Jeff Ping, Alice Li, Scott Jamar

Editors in Chief: Lorra Liu, John North

Editors: Jane Chen, Simon Locke, Colin Fuller, Gary Taylor, Tracey Hum, Robert Peterson,

Chris DeJohn, Michele Fowler, Eric Gill, Sonja Thompson

Circulation: Jing Chen

Program Manager: Pauline Zhang

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Digital Platform: Building the Foundation for the Digital World

By Yan Lida, Board Director and President of Enterprise Business Group, Huawei Technologies Co., Ltd.

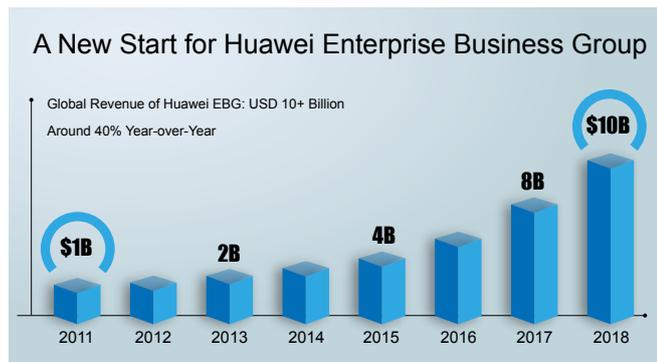
Since its establishment in 2011, Huawei's enterprise business has grown tenfold, with an annual compound growth rate of 40 percent. In 2018, Huawei's enterprise business accomplished historic achievements, with global sales revenue exceeding USD 10 billion (CNY 67.2 billion), and the revenue in China alone exceeding USD 7.44 billion (CNY 50 billion). This is not only a joint achievement of all Huawei enterprise employees, but also a result of our customer and partner support. With their help, Huawei can better understand the industry, make our solutions more competitive, and deliver our products to enterprise customers more quickly, which gives us confidence in our future growth. Huawei has been investing more than 10 percent of its annual sales revenues into Research and Development (R&D) over the last 10 years. In total, our accumulated R&D investment has exceeded USD 58 billion (CNY 390 billion), laying a solid foundation for the development of leading products and solutions in China.

Huawei is not only the top player in traditional ICT in terms of enterprise products like storage equipment and switches, but we also make remarkable breakthroughs in future-oriented new ICT fields. In 2018, our cloud business revenue grew tenfold, and our Government Cloud business is now number one in the market.

With the growth of our enterprise business, Huawei has built a prosperous ecosystem with a growing number of partners. In the past year, we secured two partners worth more than USD 1.49 billion (CNY 10 billion) in scale — China National Building Material Group and Digital China.

The percentage of our partners worth more than USD 14.9 million (CNY 100 million) has increased by 67 percent, reaching nearly USD 15.6 million (CNY 105 million). In addition to revenue growth, partner capabilities are growing rapidly.

In 2018, Huawei and over 700 partners jointly released more



than 900 industry-specific solutions covering transportation, electric power, campus, and smart cities. At the same time, Huawei made great progress in the cloud ecosystem.

In 2018, our cloud partners nearly doubled from more than 1,800 to over 3,500; our developers multiplied by 20; and our total online paying users is now 15 times larger.

Today, at the new starting point of more than USD 10 billion (CNY 67.2 billion), we face unprecedented opportunities as well as challenges. According to a Gartner forecast, investments in ICT hardware in China will experience rapid growth from 2019 to 2022, with an annual compound growth rate of 15 percent, before entering a slow growth period of only 2 percent. With a gloomy future ahead, how should we seek new growth?

Digital Transformation — Driving Future Growth

“[Do we] focus on carving up the existing pie or making a bigger one,” Huawei rotating chairman Guo Ping asked at *HUAWEI CONNECT 2016*. “For Huawei, it is more important to expand the whole market than to compete for more market share.”

Today, as digital transformation sweeps across industries, there is a great opportunity for market expansion.

According to IDC reports, with increasing digitalization, new ICT expenditures are growing rapidly. Between 2017 and 2019, global ICT expenditures related to digital transformation increased by 42 percent, which brings a huge opportunity not only for Huawei, but also for our

With the dawning of an intelligent world, Huawei repositioned its enterprise business with a new guideline — Huawei is committed to building a digital China, but also the foundation of the digital world through ‘ubiquitous connectivity + digital platform + universal intelligence.’



partners. This is corroborated by Gartner’s CEO survey, which says 67 percent of enterprise CEOs choose digitalization as their core strategy, and 61 percent plan to increase IT investment in 2019.

There is an explosion of digitalization and intelligence across all industries. Many traditional industries like banking, automotive, and electric power have entered the fast lane of transformation. In the future, digitalization will be the biggest opportunity for traditional industries. Successful companies from all industries are adopting the latest digital technologies and injecting vitality into traditional processes, production modes, and business models.

The future is bright, but there will be challenges along the way. According to the latest Huawei survey, the major challenges facing enterprise digital transformation include insufficient stimulus due to unclear business value, insufficient technical capabilities, and a lack of investment in new ICT systems.

- **Challenge 1: Improving Service Enablement With the Limited Value of Existing Informatized Data**

Currently, the digitalization of most enterprises still focuses on mining value from management data. Since 90 percent of enterprise data comes from the production system, real digitalization should not only focus on reshaping the production system, but also on digitalizing the physical world and integrating production and management data to create greater business value. The real challenge to enterprises in deep-level transformation is digitalizing the physical world.

- **Challenge 2: Quickly Acquiring Talent for Digitalization During Rapid Technological Innovation**

Digital transformation requires a wide range of new technologies,

such as cloud, big data, the Internet of Things (IoT), and Artificial Intelligence (AI). Furthermore, enterprises often use different technologies from different suppliers, and it is extremely difficult for customers to effectively integrate these technologies. This places a high demand on engineering capabilities, so acquiring professional talent is an inevitable challenge.

- **Challenge 3: Ensuring Seamless Interoperability of Old and New Systems to Ensure Continuous Service Development**

Most enterprise investments in new ICT systems are insufficient, with only 20 percent of investments going toward new system construction, while 80 percent are used to maintain old systems, because the old systems continue to support a large number of core services. This means that the new systems must integrate with the old systems within a certain period of time, which is difficult for many CIOs.

Building the Foundation for the Digital World

We are living in an era of constant innovation and disruption. All industries are going digital and intelligent. All organizations are experiencing huge impacts from technological advancement and business innovation. However, the success of the past is not always a reliable guide to a prosperous future. When faced with change, each organization should reposition itself and adapt to seize historic opportunities.

Huawei is no exception. In 2011, Huawei held its first strategic enterprise business retreat in Suzhou; established the Huawei Enterprise Business Group (EBG); and announced its goal of USD

10 billion (CNY 67.2 billion) in revenue. Realizing this goal has been a milestone in our development. In 2018, we held our second strategic retreat for our Enterprise Business Group in Suzhou, announcing our new positioning and kicking off a new era for Huawei EBG.

With the dawning of an intelligent world, Huawei repositioned its enterprise business with a new guideline — Huawei is committed to building a digital China, but also the foundation of the digital world through ‘ubiquitous connectivity + digital platform + universal intelligence.’ We will cooperate with our partners and integrate various ICT to help relevant industries succeed in digital transformation.

Huawei Digital Platform Deeply Integrating the Physical and Digital Worlds

The digital transformation of industries requires aggregating data and generating intelligence from data in order to realize digital operations. Huawei’s digital platform is the foundation of a digital world that enables data aggregation, data intelligence, and data operations.

Based on cloud technology, Huawei’s digital platform integrates new ICT, streamlines various types of data, and supports rapid development and flexible deployment of applications to enable agile service innovation. Through ubiquitous connectivity, Huawei’s digital platform also enables ‘cloud-pipe-device’ coordination and optimization, thereby integrating the physical and digital worlds.

Huawei’s digital foundation includes the following characteristics:

- **Cloud-Only: Seamless Online and Offline Interoperability and Interconnection**

Digital solutions must grow on the public, private, and hybrid clouds. The clouds must conform to the ‘same architecture, same API, same experience,



Based on cloud technology, Huawei’s digital platform integrates new ICT, streamlines various types of data, and supports rapid development and flexible deployment of applications to enable agile service innovation. >>

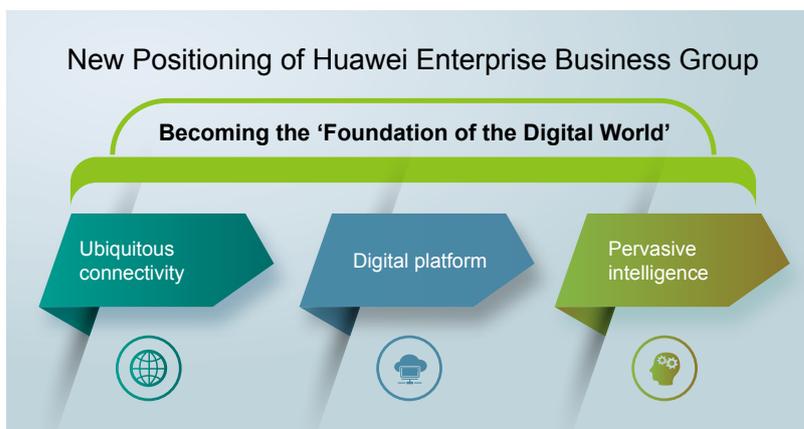
same service, and same ecosystem’ principle in order to realize one-time development, one-time interconnection, and multi-cloud deployment for customer and partner applications and software.

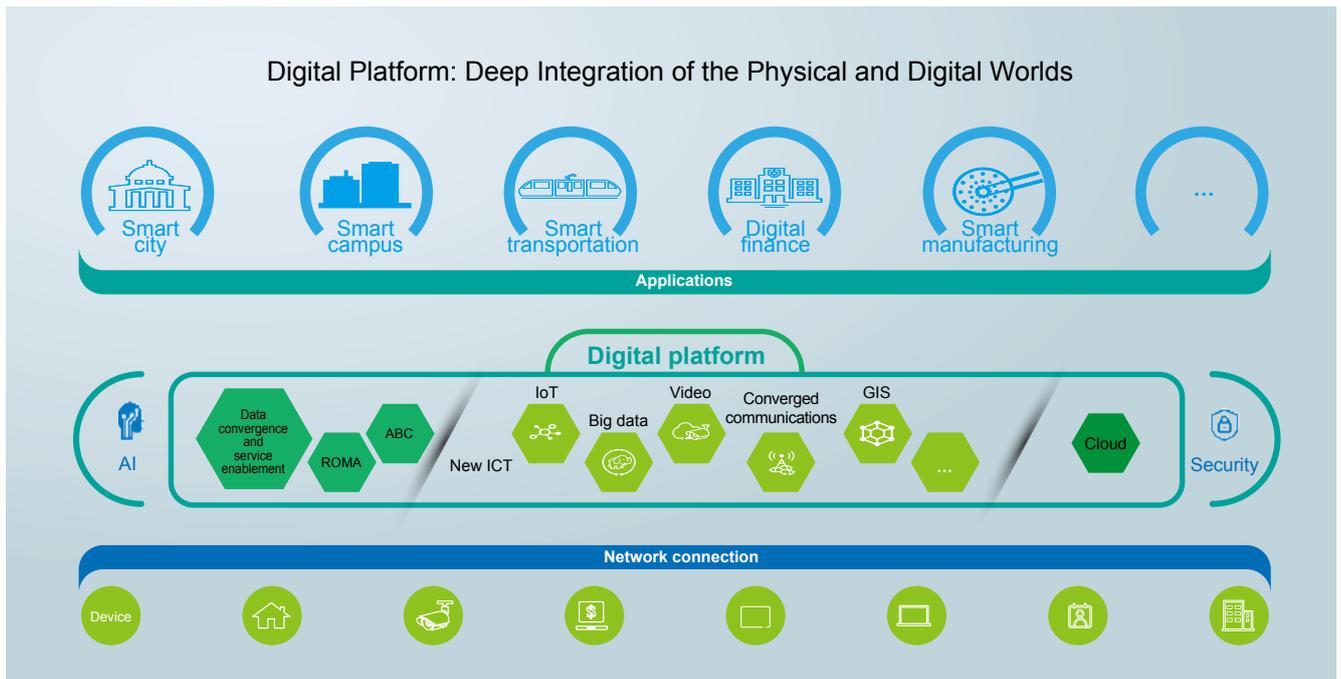
- **Full-Stack, All-Scenario Inclusive AI at Your Fingertips**

Full-stack means providing a powerful, economical, and low-threshold application development platform for AI application developers to achieve simple, agile, and efficient AI data modeling, model training, and application development. All-scenario means universal intelligence that covers any business scenario; including the device, edge, and cloud. Huawei has talked about ‘inclusive AI’ on multiple occasions and is committed to providing affordable, easy-to-use, and reliable AI for the general public. We will collaborate with customers, industry partners, and academia to build ubiquitous AI.

- **Secure and Trustworthy, Resolving Enterprises’ Security Concerns**

Security is a systematic project. Huawei is willing to work with partners to build security solutions that safeguard the digital transformation of our customers. In addition, Huawei will increase investment in the security field and improve the security and resilience of our products and solutions through four measures. First, adopt AI to implement





intelligent threat detection and automated threat processing. Second, use cloud Disaster Recovery (DR) to ensure service continuity, support multi-cloud management, and realize redundancy for public and private clouds. Third, leverage terminal-platform collaboration for intrusion prevention; for example, intrusions can be prevented by inspecting for unauthorized access to cameras. And fourth, leverage digital platform and connection collaboration against network attacks. After the attack source is discovered, a policy for preventing attacks is formulated and directed to the network device, for example, and no attack packets are forwarded.

Joining Partners to Build a Prosperous Ecosystem in the Intelligent Era

It is impossible for Huawei to build the foundation for a digital world without the help of our partners. On the journey of digital transformation, Huawei will join with more partners to build a prosperous ecosystem together and help enterprises go digital.

In the era of intelligence, the key to a win-win ecosystem is that everyone can bring their own strengths and create a '1 + 1 > 2' effect. To this end, Huawei will continue to enhance our platform. However, a platform without an ecosystem is doomed to perish.

To address the three major challenges of digital transformation, Huawei will enhance the construction of the solution ecosystem, the investment and financing ecosystem, and the talent ecosystem. Together with our traditional sales and service partners, Huawei

will provide end-to-end service capabilities such as integration, consulting, application, and operational services. We will help our customers reach new heights by providing better support and a bigger platform.

• Reaching New Heights

Big dreams help us reach new heights. There is a saying in the industry that third-class companies develop products, second-class companies build a brand, and first-class enterprises formulate industry standards and sell 'the rules of the game.'

Companies that develop standards and rules always grow rapidly and become the most powerful in the end. We know that the power of a single company is always limited. We insist on working with ecosystem partners to jointly create industry standards and define industry rules. This is the basis for successful digital transformation.

For example, in the smart city field, Huawei cooperates closely with ecosystem partners to promote the maturity of smart city standards through a large number of project practices and applications, including initiating IEEE international standards and promoting the implementation of the smart city digital platform.

Huawei also builds APIs for applications and creates physical models, data models, and device access standards based on IoT capabilities. In addition, Huawei has established the Smart City Industry Ecosystem Research Group with its partners. In China, Huawei has been actively involved in the formulation of national



Huawei hopes to increase the number of solution partners to more than 2,000 over the next three years through continuous investment. At the same time, there will be more financial support for partners.
 >>

standards for smart cities. So far, we have completed the creation of more than 30 standards to promote the development of smart cities in China.

- **A Bigger Platform**

In 2017, Huawei released the OpenLab plan. So far, we have established Open Labs in 14 cities globally, creating a platform for connecting the entire world. Through the OpenLabs, Huawei and our partners can jointly innovate in places closest to customers and where integration and verification activities are supported. In the past two years, more and more of our partners from China have stepped onto the world stage.

Consider Yanbu in Saudi Arabia. The city is not only the third largest oil refining base in the world, but also a pioneer in government digitalization, playing a role like that of Shenzhen in China's reform. During the Yanbu project, both Huawei and our partner ReSafety sent dedicated personnel on site. As a result, it took only six months from solution design to system rollout. In other ongoing smart city projects in Italy and Ukraine, Huawei and ReSafety have also made significant progress in terms of the joint IOC solution, achieving a '1 + 1 > 2' effect.

- **Better Support**

Huawei will invest more in solution incubation, smart marketing, solution replication, and partner incentives to provide better support for partners and help them transform.

- **Solution incubation and smart marketing:** Huawei built the Marketplace platform to exhibit solutions. Partners display their applications on the Marketplace to provide customers with easy access to the latest solutions. This will drive the development of the whole industry chain. Currently, there are more than 1,000 solutions on the platform, and the cycle of joint solution pre-integration has been shortened by 3-6 months. In 2019, Huawei

will enhance the AI capabilities of the platform by introducing new functions, such as partner capability profiling to support more accurate service matching.

- **Solution-oriented replication:** The 'Huawei + A to B model' will be strengthened. Huawei will encourage both solution development through joint innovation, and traditional partners to strengthen the sale of competitive solutions. In 2018, Huawei replicated more than 300 projects. In 2019, Huawei will focus on nearly 120 leading solutions and hopes to replicate more than 500 projects. Huawei will increase incentives and set up dedicated support teams for solutions and partners with high replication rates.

- **Partner incentives:** Huawei will provide USD 17.8 million (CNY 120 million) for partner enablement training and help partners improve solution capabilities. Special incentives of USD 66.9 million (CNY 450 million) will also be earmarked to encourage partners to prioritize cloud and solution sales. Huawei hopes to increase the number of solution partners to more than 2,000 over the next three years through continuous investment. At the same time, there will be more financial support for partners. In 2019, Huawei will provide more than USD 2.23 billion (CNY 15 billion) in capital and USD 1.93 billion (CNY 13 billion) in credit for partner financing in order to help them grow quickly.

More than 2,000 years ago, the ancient Greek mathematician and philosopher Archimedes remarked, "Give me a firm spot on which to stand, and I shall move the earth." Today, we are marching into an intelligent era; leveraging digital technologies as well as open and win-win ecosystems. Huawei will team up with global partners to build an intelligent world and help more customers achieve business success. ▲

Industry Pioneers'
Digital
Transformation



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Power Transmission and Communication Solutions
Build Reliable Backbone Networks

211 of the Fortune Global 500 companies
choose Huawei as digital transformation partner



Platforms + User Experience Drive Huawei's Digital Transformation

By *Tao Jingwen, Board Director and President/CIO of Quality, Business Processes, and IT Management, Huawei Technologies Co., Ltd.*

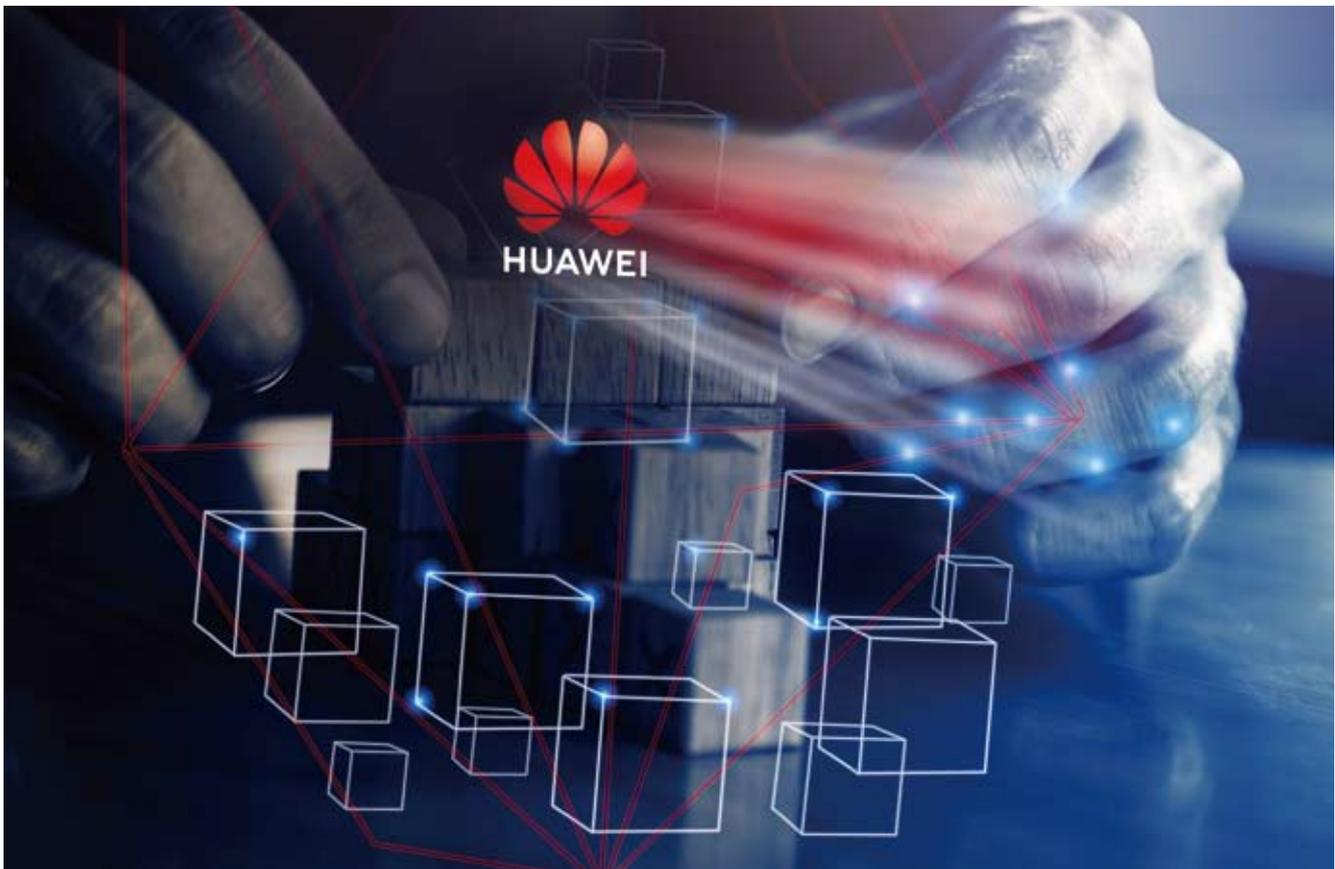
Founded in 1987, Huawei has accumulated more than 30 years of engineering and manufacturing experience. The company is committed to standards-based innovation, and remains focused on providing the world's best communications equipment to telecommunications companies and enterprise businesses around the globe. The Huawei industry ecosystem includes millions of partners and customers, and hundreds of millions of consumers are using Huawei's digital platforms.

- Huawei entered the consumer electronics sector in 2007. In 2017, smartphone shipments hit 153 million units, and by 2018 Huawei had become the second largest mobile phone supplier in the world.

- Since 2008, Huawei has invested more than USD 57.7 billion

(CNY 390 billion) in R&D and obtained more than 74,000 patents.

- In 2016, the company launched a cloud service for the enterprise IT market, with the goal of providing best-practice digital transformation solutions for enterprises in every industry.



‘Digital First’ is Huawei’s strategy to achieve comprehensive industry benchmarks that are fully connected and intelligent. Informed by our own digital transformation, the company is driven to deliver superior digital platforms and positive user experiences for all of our customers.

- 2018 global sales revenues are estimated to be USD 108.5 billion (CNY 731.8 billion).

- In 2018, the company ranked 72nd on the *Fortune Global 500*. It has approximately 180,000 employees, more than 900 branches, 14 R&D centers, 16 factories, and more than 190 central warehouses in more than 170 countries and regions.

By every measure, Huawei has achieved remarkable results; but, like many companies operating today, has overcome multiple challenges on the way to a successful digital transformation.

For Huawei, this transformation continues to present opportunities to improve our complex business environment — including services, customer segments, scenarios, global resource allocation, and localized operations.

We expect that Huawei will continue to succeed because of our forward thinking and enthusiasm for coordinating with our customers and partners across industries to better manage the complexities of digital transformation that we all face in our respective businesses.

Huawei’s Digital Vision

When considering the effort necessary to undertake one’s own digital transformation, there are two important questions:

- Why should a company undergo digital transformation?
- What is the vision or objective of this transformation?

At the moment, the world is focused on Artificial Intelligence (AI), big data, cloud computing, and the Internet of Things (IoT). Is the deployment of these technologies reason enough to pursue digital transformation? Huawei’s view is that digital transformation should arise from a company’s core business goals and be concentrated on delivering the highest possible customer experience; and only from this starting point can such an undertaking be properly managed.

Truth be told, Huawei itself was not always so holistic in its approach to digital transformation. When the company first formulated a transformation plan in 2016, the goal was simply to use advanced digital technologies and platforms to enhance business processes, lead the implementation of ROADS (Real-time, On-demand, All-online, DIY, Social) experiences, and establish new ICT industry benchmarks.

By the end of 2017, Huawei’s vision and mission had evolved. The company is now committed to bringing digital transformation to every person, home, and organization to create a fully connected, intelligent world.

Before Huawei can expect to digitalize the industry and society-at-large, the company understands that we must first transform ourselves into a fully connected, smart enterprise — and to achieve this, we have decided to prioritize our own digital transformation for the next five years.

By accomplishing ‘Digital First’ — becoming fully connected and smart — Huawei hopes to create new industry benchmarks for efficiency, effectiveness, and customer satisfaction.

Digital Platforms Resolve the Challenges of Our Time

Let’s revisit the question, “Why should an enterprise undergo digital transformation?”

First and foremost, the fourth industrial revolution is upon us, and digital production using data processing tools such as ICT platforms, software, and services is becoming a common practice across all businesses.

With the expectation that profound changes will impact every aspect of society, digitalization is spawning new business opportunities and revenue sources.



In today's world, as long as a business problem can be identified, the technical solutions will always be available. For Huawei, we believe that the 'CBA + ABC' V-model is a reliable foundation for all enterprise digital transformations. >>

As we look through the rear-view mirror at the third industrial revolution, we see that enterprises eliminated production bottlenecks by introducing automated manufacturing using robotic assembly lines. Factory automation by itself was, however, insufficient to overcome 'Baumol's cost disease.'

According to the Baumol effect, the salaries of workers whose jobs cannot be automated will rise despite the lack of productivity gains. What this means is that the operating costs for 'non-progressive' departments grow while improvements in efficiency remain flat.

Huawei CEO Ren Zhengfei understood this when he visualized the company's future operating model as three employees doing the work of five, and receiving the pay of four.

Zhengfei's model is difficult to achieve because enterprises inherently involve departments such as human resources, services, and finance — departments where adding new machines does not translate to improved efficiency.

Low operational efficiency and high operating costs are the business challenges of our time; and so far, advancements in robotics and other forms of mechanical automation have been unable to solve operational bottlenecks throughout an organization. But digital technology in the form of shared data pools *will* eventually solve these problems and allow enterprises to simultaneously optimize products, experiences, and costs.

In the rising digital era, enterprises will deliver quality products, excellent experiences, and lower costs by using intelligent machines and service platforms to carry out digital transformation.

The modernization of traditional industries is far easier said than done. Among the many obstacles that exist in legacy IT systems are proprietary hardware and software interfaces that have created isolated data sources and closed application silos

that are difficult to overcome.

Data silos impede sharing and mining within each legacy system, and over time even the most carefully engineered business processes become increasingly complex and inefficient.

Segmented business scenarios lack real-time service connectivity. At Huawei, the result was a lack of 'awareness' on the part of the IT system for both corporate management and the user experience. The company had built thousands of applications that were function-centric, rather than user-centric. For example, employees traveling out of the office had to complete five or six different workflows, and delivery department staff were subject to 26 different IT systems and nearly 40 different hurdles every single day. Huawei has learned that the same phenomenon is occurring in most businesses. Have our internal technology departments *really* been working to streamline business processes and serve users?

When businesses discuss digital transformation, the discussion often begins with a focus on technology. However, based on years of experience, Huawei has determined that the transformation solution requires a combination of technology *and* business that simultaneously align business fundamentals and create value for customers and users.

Digital transformation is a two-line V-model. The Customer-Business-Architecture (CBA) line is focused on the customer as the driver of business and architectural improvements. The AI + Big data + Cloud (ABC) line is focused on unified cloud platforms as the foundation for deployed solutions.

Technical capabilities are secondary. Enterprises must first identify who their customers are and what they need; then, determine whether their staff and organizations are suitably prepared to carry out a digital transformation.

Only after the assessment of customer and staff



requirements should enterprises begin to consider the particular digital technologies to solve corresponding problems.

In today's world, as long as a business problem can be identified, the technical solutions will always be available. For Huawei, we believe that the 'CBA + ABC' V-model is a reliable foundation for all enterprise digital transformations.

5 Digital Transformation Goals

Huawei's plan is to establish a new industry benchmark for fully connected, intelligent systems by 2021.

Externally, Huawei wants to conduct business with customers more easily, efficiently, and securely. Internally, the company expects to further improve operational efficiency and effectiveness.

Huawei has redefined its digital transformation architecture to include five objectives:

- One-stop experiences that use digital approaches to enhance and deepen customer-facing interactions
- Scenario-based architectures that include flexible service orchestration, custom-built solutions, and support for service innovation that improves efficiency and effectiveness
 - Middle-end services that are combined with cloud IT platforms
 - Rapid acquisition of external service resources via multi-cloud management platforms
 - Real-time service perception and operational command

So, how do we achieve this?

- **One-Stop Experiences**

First, we must deepen connectivity to achieve user satisfaction by building one-stop service experiences for five different types of

users: enterprise customers, consumers, partners, suppliers, and Huawei employees.

Our aim is to build service platforms that link our customers, end-users, partners, and development teams with the equipment and knowledge necessary to fulfill their goals with one-stop.

Take telecommunication customers for example. In the past, Huawei developed mobile applications on its own, without considering actual user experiences. But now that the barriers to entry have been lowered, our technical platforms allow us to provide content that is unique to each customer.

Huawei also provides online digital channels to push customized, multi-channel content to select customers. In addition, integrated customer data from all pre- and post-sale phases is combined with unique customer IDs and intelligent analysis to promote customer needs in real time and enable unparalleled customer service. In the future, unsurpassed user experiences will be delivered on the basis of each customer's own usage and operating habits.

- **Scenario-Based Services**

Second, we need to provide flexible and fast service orchestration support for global operations based on real-world operating scenarios.

As it turns out, revising a simple service process is extremely time consuming, and meeting Zhengfei's 'one country, one policy' requirement for rapid response to service changes is nearly impossible.

Huawei established a future direction for transformation that analyzed each of the company's independent service scenarios, including their open interfaces, in order to support flexible

scheduling for service personnel.

We have now built a company-wide, platform orchestration map that covers more than 200 standard service scenarios.

In this way, if a new scenario requirement is added anywhere in the world, users can subscribe to the service online and the IT department will quickly deploy the appropriate service. This changes the way IT provides services and avoids resource shortfalls. And by using standardized IT equipment services, users in different parts of the world can also gain an ‘equal distance’ access experience.

For example, to enable rapid global store openings, Huawei now provides standardized IT equipment and services to mobile phone retailers. IT application services — like invoicing and inventory platforms — have been placed in data centers in 15 different regions to ensure that response times are less than three seconds, anywhere in the world.

In addition, by standardizing on-site equipment and services, store opening times for third-party partners like Ingram, Vodafone, and Suning.com have been reduced from three-to-six months to one-



Today, there are more than 200 examples of AI applications in use at Huawei, and demand for similar services will continue well into the future. We hope that our industry partners and AI manufacturers will join with us in harnessing AI technology. >>

to-two weeks.

• Service Platforms

Third, we need to establish a general platform for digital transformation that supports service growth. In order to better support digital transformation across all domains, Huawei has created a public IT platform that provides more than 600 services in four service categories (basic, platform, application, and security).

Imagine a solar system. To realize a central supply strategy and differentiate the platform owner’s services from third party services, we position the public platform as the sun, and then determine which services will make up the rest of the solar system. Public platform services are selected based on the user’s perspective. Service Level Agreements (SLAs) are created and users can rate services online.

In addition to the platform, we build a middle-end application for the three main customer-facing processes: service activities, transaction records, and problem resolution.

The IT department has transitioned from providing functions to offering services. After transformation, these services become building blocks that can be customized. To date, Huawei has built more than 150 application service frameworks, and plans to add more than 50 per year for the foreseeable future.

In the past, due to the rapid changes in services and the variety of scenarios, the IT department could only develop scenarios one at a time. They were constantly swimming against the tide.

Today, Huawei supports rapid service innovation by quickly arranging services according to each scenario. In the future, Enterprise Resource Planning (ERP) will become a true ‘system of record’ as only transaction results will enter the ERP system. This will reduce the burden on ERP systems, and make

To support digital transformation in all fields, Huawei is building a comprehensive ‘public platform.’

- Provides **600+** services in **4** categories (basic, platform, application, and security).
- **150+** application service frameworks are built, with **50+** to be added annually.
- **200+** AI applications in multiple categories.
- Translation service provides real-time translation in **60+** languages for employees in **170** countries.



ROMA supports the global integration of more than 600 service applications, Remote Desktop Connection (RDC) with 17,000 integration points, and daily data traffic of 2 billion items with more than 4 billion peaks. >>

ERP software packages a stable back end component.

In 2018, Huawei increased its adoption of AI technology, particularly in the company's high frequency, complex, large scale operating scenarios — turning dumb processes into intelligent ones.

An example of the efficiency of AI in support of Huawei's administrative services, is that a staff of only 700 administrators is needed to support the access management and visa requirements for 180,000 employees in more than 170 countries. This level of success cannot be overstated.

Today, there are more than 200 examples of AI applications in use at Huawei, and demand for similar services will continue well into the future. We hope that our industry partners and AI manufacturers will join with us in harnessing AI technology.

If Huawei can solve its own problems, then we can resolve issues in other companies and industries, as well as overcome the bottlenecks currently facing AI development.

All companies must guarantee security for their core information assets throughout the digital transformation period. Huawei's real-time security services encompass policy centers, profiles, and security fences that, together, ensure a transparent and imperceptible end-user experience.

Huawei's principle is 'security first for core assets; efficiency first for non-core assets.' This principle is a response to historical missteps in managing enterprise resources. Two misunderstandings have plagued enterprises when it came to managing their core assets. One was 'protection for the sake of protection' or 'security for the sake of security.' A recent example of this is the rejection of public clouds by cautious companies at the expense of slowed response times and limited data sharing across the enterprise.

Another mistake is to ignore necessary data security and add excess information to public clouds — a choice that will inevitably lead to data breaches

and loss of core information assets.

Huawei rebuilt its own security systems holistically by selectively granting access to information across carefully determined corporate boundaries.

Companies need security between objects and subjects that enable user-imperceptible security services, which is an important part of enterprise digital transformation.

- **Multi-Cloud Management Ability**

Fourth, we need to build Relationship, Open, Multi-ecosystem, and Any-connect (ROMA) multi-cloud management capabilities for internal and external interconnections and interoperability. Connectivity is the core foundation for accomplishing digital transformation for traditional, non-cloud enterprises. This is why Huawei has built ROMA capabilities to secure external corporate boundaries to quickly introduce existing, mature services into multi-cloud environments.

For example, Huawei's translation service provides real-time translations across more than 60 languages for employees from more than 170 nations.

ROMA supports the global integration of more than 600 service applications, Remote Desktop Connection (RDC) with 17,000 integration points, and daily data traffic of 2 billion items with more than 4 billion peaks.

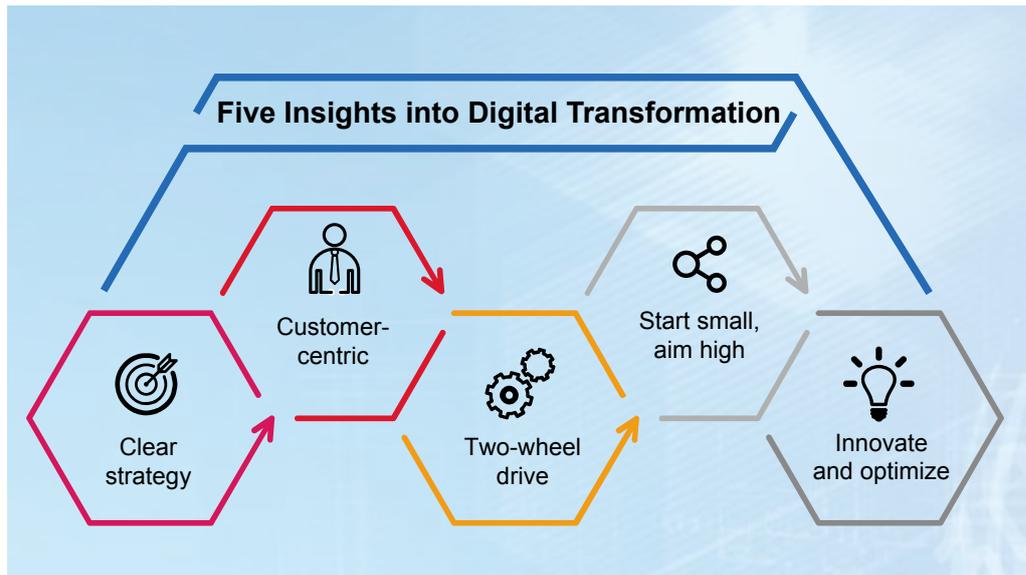
Harnessing ROMA multi-cloud services to achieve internal and external interconnections and multi-cloud interoperability helps us quickly coordinate multi-cloud services and aggregate advanced productivity. It allows our cloud service platform to connect information silos, eliminate digital gaps, aggregate cloud capabilities, transform into a powerful middle-end service platform, and support rapid enterprise business development.

- **Operational Command Platform**

Fifth, we need to build an 'Operation Command Platform + Cavalry' for real-time operations. The operational command platform harnesses AI, big data,



‘Digital First’ is primarily a business transition and should be led by the business division. It is a top-level project that requires firm strategic determination and decisive action once a direction is chosen. You must build a ROADS experience driven by customer and end-user needs. >>



and visualization technologies to present data in an actionable way for customers and end-users.

To better prepare for the future, Huawei is revamping its entire operating system to create a real-time, intelligent command platform. The ultimate goal is the creation of a full-service, full-scenario operations center that provides service monitoring and alerts, process coordination, event scheduling, and forecasting to support our digital transformation and service development.

In the end, the transfiguration of culture, organization, and talent is paramount to enterprise digital transformation.

Building Huawei’s customer-centric corporate culture has involved two core concepts:

- First, establish a team where technology and services are integrated to resolve real-world issues.
- Second, build an efficient technology platform.

For example, Huawei’s original IT teams created tools, products, and equipment that would provide thoughtful services and win satisfaction. Now that the tools and equipment have matured, IT is the business enabler that needs to win the respect of customers through continuous improvement.

Two assets will be important to enterprises in the future: First, the business enablement team, and second, the IT service platform.

Enterprises need a digital platform to support the

need for diversified business development. Huawei, for example, has four major types of business. This would be difficult to support without a universal and flexible unified service platform and a real-time command center that manages intelligent operations for service awareness.

Digital Transformation Insights

Finally, I want to share the insights I have gained from managing Huawei’s digital transformation.

‘Digital First’ is primarily a business transition and should be led by the business division. It is a top-level project that requires firm strategic determination and decisive action once a direction is chosen. You must build a ROADS experience driven by customer and end-user needs. You need to build a two-line V-model of business and digital technology that aligns with your business while creating more value for your customers and end-users.

Aim high, but start low. Create a blueprint and a systematic design. Start by identifying the enterprise’s real problems, find breakthroughs, and resolve single issues before trying to cover all areas.

Digital transformation cannot be achieved in a single stroke. Choose a direction, keep innovating, and respond with speed and flexibility. ▲

Industry Pioneers'
Digital
Transformation



Digital First, For a Fully Connected, Intelligent Huawei

User experience + Digital Platform:
The twin engines of Huawei's digital transformation

211 of the Fortune Global 500 companies
choose Huawei as digital transformation partner



Huawei Enterprise | Leading Connectivity & Intelligence

Artificial Intelligence Could One Day Determine Which Films Get Made

By Peter Caranicas, Managing Editor, Features, VARIETY

According to the founder of Artificial Intelligence (AI) outfit ScriptBook, Sony Pictures could have saved a fortune from 2015 to 2017 by using the company's algorithms instead of human beings to reject or greenlight movies.

Disrupting Film Production and Distribution

In a presentation at the Karlovy Vary Intl. Film Festival, ScriptBook founder Nadira Azermai said that by analyzing screenplays, ScriptBook retroactively identified as box-office failures 22 out of the 32 Sony movies that lost money in that period, during which

Sony released a total of 62 movies.

"If Sony had used our system they could have eliminated 22 movies that failed financially," said Azermai.

Welcome to the brave new world of AI and machine learning as it applies to Hollywood.



An AI-based script analysis company says computers can be more successful than humans in greenlighting projects.

Many see in ScriptBook and similar AI systems the potential to destroy a major part of the film production and distribution ecosystem, displacing script readers and saving much of the money studios spend on test screenings, focus groups, and market research.

At its most basic, ScriptBook, founded in 2015 and based in Antwerp, Belgium, has created a tool that analyzes the text of screenplays to produce financial forecasting, or as Azermai grandly puts it, “Our mission is to revolutionize the business of storytelling by using AI to help producers, distributors, sales agents, and financiers assess their risk.”

The cloud-based system is already in use. In 2016 ScriptBook raised USD 1.4 million in venture capital to accelerate development.

The system works like this: ScriptBook users upload a PDF file of a screenplay into the system. About five minutes later they receive a detailed analysis of the project that, among other things:

- Predicts the MPAA rating, analyzes its characters, detecting the protagonists and antagonists;
- Assesses the emotions of each character;
- Predicts the target audience, including gender and race;
- And, most importantly, makes box office predictions.

Providing Intelligent Movie Metrics

“When we show this to customers, the first question is: How is it even possible to give a script to a computer and somehow it can come up with all these outputs?” said Michiel Ruelens, data scientist at ScriptBook.

The answer, he says, is based on the fast-developing field of machine learning, whereby the software is first instructed by humans, then takes over the learning process and builds huge databases that can be mined at astonishing speed.

ScriptBook’s software has been ‘trained’ on a large dataset of 6,500 existing scripts, said Ruelens.

Distributors will also find added value in ScriptBook, Ruelens

added. “They take on a lot of risks when they buy rights to multiple territories. They now rely on subjective decision-making, reading the script and going with what their gut says. But we want to mitigate the risk by adding objective parameters that will tell them far more. Expertise means a lot but it’s important to back it with metrics.”

ScriptBook says that when its system indicates a script should be greenlit, it has an 84 percent success rate. This, said Azermai, is three times greater than the accuracy rate of humans.

“It’s also a validation tool,” she added. “It can validate the decisions you make.”

And in the ‘MeToo’ age, said Ruelens, ScriptBook can help improve gender parity in movies. The software can detect, for example, whether a film passes the test of including at least two female characters having a conversation that is not about men. Also, it can measure how many dialogs are between two men, how many between two women, and how many between males and females.

Naturally, the system isn’t perfect. When asked to retroactively assess the box office potential of *La La Land*, ScriptBook ‘predicted’ the film would gross USD 59 million, whereas in fact it did more than USD 100 million in business (the difference could be attributed to the movie’s multiple Oscar nominations and wins, of course). But the system ‘greenlit’ the film anyway based on its modest production budget.

Azermai acknowledged that many people think technology will eventually kill creativity, but that’s not the case, she said. “ScriptBook’s AI will just kick out movies that follow certain formulas. It’s very good at picking out artistic movies that do well financially.”

ScriptBook charges about USD 5,000 to ingest the script and generate a report on a single film, but offers discounts for companies that want to evaluate multiple projects. ▲

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The Internet of Them: AI Platforms in an Untethered World

By Julie M. Albright, Ph.D., Digital Sociologist, University of Southern California

Our reliance upon and embeddedness within technological platforms is growing at an extraordinary rate. Technology has always reshaped human culture and societies, beginning in the early Agrarian Period, when developing agricultural processes moved us from nomadic tribes toward settled cities. In the Industrial era, steam engines propelled many people who sought factory work to the cities. The spread of electrification, the railroad, and finally, the car, moved us further from those cities into suburban sprawl. Now in the Digital Era, the impacts of the growing global digital infrastructure and technological innovations are increasing faster than ever before in terms of both pace and scope of change, transforming societies on a global scale and creating new behaviors.

My framework for understanding these changes is named the *Triad of Technological Immersion*. It is a theoretical scaffolding to help us understand the stages of technological and behavioral development, for which there are three: the Untethered Society, the Internet of Me, and the Internet of Them.

The Untethered Society

In our current stage, there is an increasing desire for a digital interface; behaviors revolve around connectivity and there is a simultaneous unhooking from traditional social structures/processes. As a whole these changes can be described as becoming ‘untethered,’ and defined as:

A condition in which ties to people, places, jobs, traditional

processes, and organizing structures in society — like churches and political parties — are being weakened, broken, and displaced by digital hyper-connectivity.

Although untethering is increasing in scope across socioeconomic and generational lines, it is manifesting most notably among Millennials and those younger. The double helix of behavior and technology is at the core of becoming untethered, acting as the socio-genetic underpinning of a new constellation of behaviors, values, norms, and ideals for digital natives, and spreading through osmosis to older generations. The unintended consequences of ubiquitous connectivity are beginning to surface. Elections in the U.S., U.K., and in multiple African nations have been reshaped by the digital manipulation of people’s fears, using shareable, viral content

Now in the Digital Era, the impacts of the growing global digital infrastructure and technological innovations are increasing faster than ever before in terms of both pace and scope of change, transforming societies on a global scale and creating new behaviors.

microtargeted to psychologically and sociodemographically profiled individuals ripe for manipulation. Such moves leave traditional political structures at a loss for a response.

The Internet of Me

Next to emerge is the Internet of Me. This is the advent of the Internet of Things (IoT) and smart systems where there is an increasing intersection between physical platforms and an array of objects — from light bulbs connected to your smartphones to automobiles and homes embedded with digital technologies, calibrated to your preferences. In the Internet of Me, the technologies revolve around you, customizable to your preferences — the temperature and lighting are adjusted to your liking when you get home; and perhaps your favorite music is playing when you walk through the door. The Google Home and Amazon's Alexa use AI to search for songs, find information, and purchase goods through the Amazon Marketplace, delivered straight to your home. Kids growing up with this kind of AI are using it to learn; and one enterprising young girl recently used her access to order USD 300 in toys from Amazon, much to her mother's chagrin.

AI will continue to grow and develop as a smart interface to the Internet of Things. One example is Japan's Gatebox. Targeting young, single, male urban dwellers, it provides not only a way to turn on the lights when you get home, but also serves as a virtual wife for untethered urban adults, standing in for those relationships young people are increasingly unhooking from, yet on some level, still yearn for. Gatebox's cute, holographic virtual wife sends you text messages throughout the day, much like a real romantic partner, and greets you with excitement when you come home. As such virtualized companions become more common, they will become a

taken-for-granted part of the landscape by the next generation of kids who are growing up with them. Being that they may be faster, more accurate, and less hassle than a surly customer service agent, or even more knowledgeable than a teacher in providing information, AI agents may become for some the preferred mode of interaction.

The Internet of Them

The last stage I call the Internet of Them. In the prior stages, humans were in the loop, controlling the technologies. In the Internet of Them, intelligence becomes autonomous, spinning away from human control. It is AI and automation with the human out of the loop. They will increasingly 'talk to' and coordinate with other intelligent objects and agents, like autonomous cars communicating with one another to coordinate driving on the road. Robotic workers with 'synthetic personalities,' intelligent machines, and automated workers will begin to displace workers now in the workforce. These intelligent agents will eventually exceed human intelligence and capabilities for certain tasks.

Because of the accelerated pace of diffusion of these technologies, they may outpace our ability to adapt to them. People argue that we've always had technological disruption, and we've always adapted to it, citing the conversion from the horse and buggy to the automobile as a salient example. Yet they fail to account for the accelerating pace of diffusion and adoption: Cars took generations to diffuse, on average 44 years for full adoption. The telephone was invented in 1876, yet it wasn't until a century later that landline phones reached full saturation. In a study of the diffusion of technologies in 16 countries across the globe, researchers found it takes an average of 45 years for a technology to be fully adopted. Compare that to now, where it took half the globe less than 15 years



The march forward toward an automated world of the Internet of Them comes as good news for the data center industry of course, as our reliance upon and immersion within digital platforms continues to develop on a global scale.>>

to adopt the Internet and personal computers. Newer technologies are diffusing even faster, on average, by four and a half years. The tablet computer went from zero to 50 percent adoption in less than five years.

What are the implications of this accelerated pace of change, in terms of AI platforms and their impacts? First, based upon the diffusion patterns of other digital technologies, we can expect a shortened lag time in terms of the diffusion of AI throughout countries, since AI is built upon a digital backbone and cloud-based digital infrastructure which in many cases has already been deployed. Second, this accelerated pace of adoption means faster disruption in terms of labor. Automation has already impacted many in the blue-collar sector — particularly in manufacturing, where labor has already been replaced by trained machines. In the near future, AI and automation will threaten a wider swath of careers, reaching up the job ladder from blue-collar workers into the white-collar realm of financial traders, accountants, doctors, pharmacists, and lawyers, to name a few. One insurance company is already offering its customers a discount on the monthly

payment if they agree to see ‘Dr. Watson’ first for more routine health care issues like colds and flu. Some are suggesting AI could eventually replace four out of five doctors in the United States. In other cases, AI will be used to augment, rather than replace, professionals like physicians, or provide specialized care assistance in areas of the world where such medical specialists are unavailable. Hospitals in India, Thailand, and South Korea are experimenting with IBM Watson to assist doctors with cancer treatment where oncologists are scarce.

The march forward toward an automated world of the Internet of Them comes as good news for the data center industry of course, as our reliance upon and immersion within digital platforms continues to develop on a global scale. As certain jobs are eliminated by AI and automation, others will grow. It would behoove the industry to support training and re-training programs for workers displaced by AI and automation, as well as for younger workers seeking their first career, to ensure a strong and ready workforce to keep pace with the increasing demand for an always-on, reliable, and secure digital infrastructure. ▲





How AI Platforms are Revolutionizing Industry

By *Ronald van Loon, Top 10 Global AI, IoT, Big Data & Digital Transformation Influencer*

Breakneck speed, unprecedented development, and unhindered feasibility are just some phrases attached to the spread of AI across various industrial sectors in general. Artificial Intelligence (AI), as it stands today, is at an important juncture. The current potential for market growth in AI is extremely high. The market, which is currently estimated to be around USD 3 trillion, is expected to grow to USD 8 trillion in the next five years, which would be over 250 percent growth within a period of five years.

The success of AI platforms in general has been replicated by the success of AI in the industrial sector. Experts currently believe that AI is in a nascent stage. Growth will further materialize over time, and we will have more illustrative cases of the benefits that it brings within industries.

However, this doesn't take anything away from the use-cases or examples of today. The use of AI in the industrial sector has already started, and it has reaped genuine rewards. The current use of AI has given an indication of what we can expect in the future. We have a roadmap right in front of us, based on current examples of the present.

Impact on All Industries

AI platforms are being applied in almost every industry/industrial sector out there. User-based services including Pinterest use deep

learning to recognize images and create unique user experiences. Research and development industries use deep learning methods to detect all kinds of security risks on the Internet. Financial companies such as PayPal are assisted by pattern-driven deep learning to catch and detect fraud. Add the convenience of AI to manufacturing, medicine, education, and health care, and you get well-rounded technology that is hinting toward major growth in the future.

AI's application across industries has been assisted through its combination with other technologies including the Internet of Things (IoT), cloud computing, Augmented Reality (AR), and big data. All of these technologies are working together to create the correct operating infrastructure for AI.

Based on its uses across the industry, AI creates excellent value across a range of sectors. Not only is it expected to accurately forecast and regulate demand, but it will also help companies to

Based on its uses across the industry, AI creates excellent value across a range of sectors. Not only is it expected to accurately forecast and regulate demand, but it will also help companies to get the most out of their machines, while putting an end to unnecessary maintenance or downtime.

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These benefits will eventually add up to deliver preferred customer experiences. In the retail industry, for example, AI can help sellers pinpoint what customers want, sometimes before customers even know it themselves. The possibilities really are endless when it comes to imagining all that AI has to offer industries across the globe.

AI has opened new horizons in the industrial sector, and has augmented numerous processes and routines.

To start, AI platforms can be applied across various manufacturing processes. From self-adaptive manufacturing to predictive maintenance, automatic quality control and driverless vehicles, AI acts as the brain behind all of these processes. AI can also be used to optimize production processes in ways that reduce inefficiencies and cut downtime. Industries can also adjust and optimize the parameters within the process.

AI makes it relatively easy for organizations to design the production of new products. AI mitigates the risk of launching new products/technologies on the market. Finally, AI can help organizations identify and highlight the sources of problems more easily by using new and better anomaly detection methods.

How AI Works

Obviously, all the benefits of AI that have been mentioned above are easier said than done. The models for AI technology take a lot of insight to deliver, and can only be achieved through proper analysis and data gathering. AI can work efficiently in

several applications to augment industrial processes.

- **Predictive Maintenance**

Predictive maintenance works toward anomaly detection inside the industry. By using 100 percent of the data being generated in real time, a predictive maintenance model helps to find 80 percent more anomalies.

The prediction has been made that more than 40 percent of all unexpected downtimes in businesses occur because of asset failure. Moreover, fixed assets with problems that remain undiscovered before failure incur 50 percent greater costs. Cognitive anomaly detection can solve these problems. An AI-based anomaly method detects possible faults using a bottom-up approach, and then works to rectify them. Once anomalies are detected and predictive maintenance completed, organizations avoid the risks, inflated costs, and downtime of repairing failed components.

- **Edge Analytics**

Edge analytics fine tune the predictive maintenance process with the addition of real-time automation. With analytics data recorded and interpreted within seconds at the edge, results will be generated in near real-time. The cost of transferring data across multiple connection points is reduced, as the processors at the edges perform a first stage of work close to the sources of the information. The use of edge computing for anomaly detection can highlight operational issues in real time before performance is affected in any way.

- **Visual Inspection**

AI can use visual methods to compare products and decide

whether they pass inspection. Machine vision in precision quality analysis combines the input from cameras that are many times more sensitive than the human eye, with the AI technology used to improve image inference capabilities.

Machine vision tools work magic to reveal microscopic faults in places that would otherwise go unnoticed. Circuit board faults would often go unnoticed but for the use of video data and machine vision tools. Machine-learning algorithms are rigorously trained and supervised to generate actionable insights so that all such faults are detected and repaired.

- **More Efficient Design and Management**

The concept of the digital twin has further augmented the use of AI in design generation and anomaly detection. Assets that coexist with a digital twin are easy to monitor. When a jet engine is affected and starts to degrade or age, its digital twin will show these signs of degradation for engineers to monitor easily. This will save future costs and maintenance charges.

Use Cases

There are numerous use-cases of AI in the industrial world, including:

- The use of the digital twins across numerous industries has resulted in better asset monitoring. Many airline companies use these digital twins to measure the effects of the environment on their machinery. Digital twins quantify results through effective imagery.

- Edge analysis is in place across multiple organizations. Edgification aids the correct utilization of real-time data for real-time results. Schindler Elevators is using edge computing to generate real-time performance data for elevators, including metrics like the rate of speed for doors opening and closing.

- At CEBIT 2018 in Hannover, Germany, Huawei provided insight into real-time examples of the industrial use of AI, including smart manufacturing methods to help organizations limit waste and increase production capabilities.

- Cognitive anomaly detection has been implemented by many organizations across the manufacturing sector based on the need for resources that will limit downtime due to asset or machine failures.

Jumping onto the AI Bandwagon

There are certain requirements that need to be fulfilled in order to join the AI bandwagon:

Start by building an industrial innovation platform based on a mix of new technologies, including cloud computing, AI, and the IoT. Collaborate with the right service providers, devices, and communications to get the desired results. The collaboration between product, data analysis, machine learning, and AR combines to create a simple data model.

Additionally, building partnerships and creating ecosystems for your model is extremely important. No single enterprise can independently cater to your end-to-end solutions. These solutions cover the cloud, terminal connection, application services, and data analysis. You need a partnership with multiple service providers in order to reach this ecosystem. The aim should be to shift from 'product first' to 'service first.' The industrial innovation platform gives enterprises the drive to shift from selling products to providing services.

In conclusion, AI platforms are transforming the industrial sector and will play an important role in the times that are to come for industries across the globe. ▲



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More and more traditional industries are recognizing and prioritizing the value of platforms. What kind of platforms do enterprises desire as they go digital? What are their expectations for digital platforms and platform suppliers? How should they select an appropriate platform supplier?

What Do CXOs Want From Digital Transformation?

Emerging digital platforms are changing business models around the world. Over the past decade or so, Internet and tech giants like Google, Apple, Amazon, Facebook, Microsoft, Uber, and Airbnb have found unprecedented success, and they all started with a cloud. A common characteristic among these companies is that they all utilize the platform model and strive to develop new Information and Communications Technology (ICT).

Inspired by the accomplishments of these industry giants, traditional mainstream industries are increasingly aware of the business value that common platforms can generate. At Huawei, we are both a witness to and partner in the success of many leading companies throughout the automotive, consumer electronics, finance, and energy industries. Huawei provides support and collaboration to many visionary firms that are committed to building their own specialized platforms, such as PSA Peugeot Citroën for automobile networking, The Walt Disney Company's MagicBand, Nike+, ABB Ability, Siemens' MindSphere, Philips' HealthSuite, and Haier's COSMOPlat.

So, what kind of platforms do enterprises wish for as they go digital? How should they select a platform supplier? And what expectations do they have for the current generation of digital platforms and platform suppliers? CXOs from Ping An, Goldcard, Shenzhen University, and CERNET shared their thoughts on this matter with *ICT Insights*.

- ▶ *Ping An Group Finds Value in Digital Transformation*
- ▶ *Goldcard: Digital Transformation Ignites Public Utility Potential*
- ▶ *Shenzhen University: A New Smart Campus Experience*
- ▶ *Building the CERNET Digital Education Platform*



Ping An Group Finds Value in Digital Transformation

Ping An Group (Ping An) is a financial services company that is active in many vertical markets, including health care and Smart City planning, and despite the company’s current wide-range, remains focused on its core expertise in the digital transformation of the financial technology sector. Ping An has encountered two main challenges in the area of digital transformation.

First, the development of the digital economy is spurring transformations across every industry, yet the value of the results is still being determined. How is it that new digital solutions, such as AI + Big data + Cloud (ABC) platforms, improve business value and help companies leverage change? However challenging, a key step to joining the digital economy is to find methods to apply these new technologies in seamless, efficient, and green ways.

Second, as the digital economy continues to evolve rapidly, engineers are inspired to create new and better ICT solutions to address previously unforeseen scenarios. In all cases, innovation comes with information security, management, and technical risks — and especially in the area of information security, mitigating risk when adopting new technologies is a threshold challenge before any enterprise can embrace the full potential of the digital age.

• Digital Transformations Require Mature Digital Platforms

We believe that mature digital platforms are an essential resource to the successful fulfillment of the digital transformation process. This is true not only for enterprises, but also for nations. In the era of the digital economy, China’s national cybersecurity and information services depend on the support of advanced digital platform technologies. Leading enterprises across all industries in China — including Ping An in financial services; Huawei in telecommunications; and Haier, Midea, and Gree in home appliances — all require mature digital platforms to carry out their large-scale transformations.

The development of any enterprise is dependent on the adoption of new technologies, and the bigger the enterprise, the more technical resources it needs:

- **Future Smart Office** — Transitioning from traditional paper-based offices to paperless smart offices improves efficiency and reduces emissions.
- **Full connectivity, mass data storage, in-depth data analysis, and precision marketing** — These features help companies shift from traditional, quantity-driven development models to a form of enterprise development where quantity and quality are equally important.



“Mature digital platforms are needed to carry out large-scale digital transformations at both the enterprise and national levels. With this understanding, the collaboration between Ping An Group and Huawei has constructed an ecosystem to better promote the utilization of digital platforms across the entire financial services industry.”

— Gavin Li, Ph.D., General Manager, Information Security Operations & Expert Services Departments, Ping An Insurance (Group) Company of China, Ltd.; Executive Vice President, Ping An Financial Security Research Institute; and Executive Director, Financial Industry Security Research Center, National Engineering Laboratory for Big Data Collaborative Security Technology



- **Cloud computing** — The Chinese government is encouraging enterprises like Ping An, Huawei, China Merchants Bank, and Hainan Airlines to adopt cloud computing. Cloudification has become a rigid demand for enterprise development in order to meet national development requirements.

All of these innovations are dependent on digital platforms and digital technologies like AI, big data, and cloud infrastructure.

Huawei and Ping An are strategic partners. The two companies have a long history of extensive cooperation that is focused on data centers and ICT infrastructure, including network equipment, servers, and the specifications for equipment room construction. Information security, in particular, has become increasingly important as Ping An’s business has grown. The two companies continue to have in-depth discussions about how Huawei’s next-generation firewalls, border defense equipment, AI security, big data security analytics, and other platform technologies can keep up with Ping An’s application and technical needs. Ping An’s financial services business has already deployed many of these technologies. Additionally, Huawei is an important strategic partner in the Smart City market, an area where Ping An continues to expand its work.

As part of this collaboration, Huawei provides two important strengths. The first is specialization in the development of digital platforms and technologies, through which China’s national industries have received help as a result of Huawei’s continuous

investment in R&D and commitment to an independent R&D model. The second is Huawei’s specialist teams. Digital platform specialists support their customer base by helping enterprises implement automation, intelligence, and visualization applications through continuous optimization and evolutionary processes.

- **Building a Favorable Industry Ecosystem For the Digital Platform**

Huawei strives to create digital platforms, train employees, and continuously launch excellent products and solutions. Looking into the future, the company is acting as a ‘guiding intermediate force’ to build ecosystems that help companies like Ping An better apply digital platform technology. This level of work will help entire industries realize their digital transformation goals.

Based on its experience working with Huawei, Ping An is building a digital ecosystem that supports its expansion into sectors beyond the finance industry. All enterprises need a similarly favorable industry-development environment.

The Ping An Group hopes Huawei will continue to contribute to building digital platform ecosystems by providing key specialists, and that they share their experience with the entire financial technology industry, particularly on the topic of constructing AI platforms. This type of cooperation is helping the whole industry to use digital platforms to their maximum potential. In this regard, Ping An plans to work together with Huawei to quickly fuel the development of digital ecosystems for multiple industries.

Goldcard: Digital Transformation Ignites Public Utility Potential

Founded in 1997, Goldcard Smart Group Co., Ltd. is a complete public utilities-solutions service provider that offers continuous innovation based on customer requirements. Goldcard solutions cover smart devices, communication networks, application management, and Internet cloud services. Listed on the Shenzhen Stock Exchange since 2012, the company serves over 2,000 public utility enterprises and more than 35 million households in over 1,500 cities.

Goldcard has been exploring and implementing natural gas Internet of Things (IoT) solutions since 2013 — including the world's first Narrow Band-IoT (NB-IoT) proof-of-concept project for smart meter reading, and has been committed to promoting the development of smart utilities worldwide. To date, Goldcard has installed more than 5

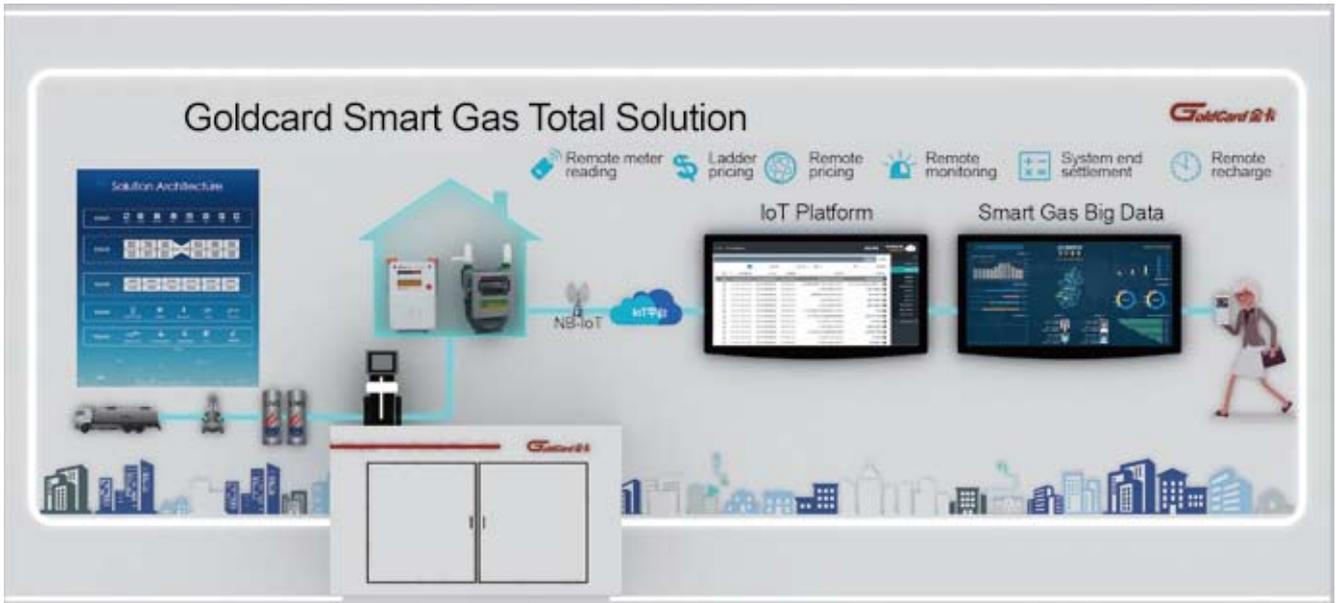
million IoT meters across China. The company has also begun early trials for cloud-based, back-end data processing and business support. Today, Goldcard boasts over 500 public cloud customers and more than 1.5 million IoT devices connected to the public cloud.

As a pioneer in IoT applications in China, Goldcard has encountered numerous difficulties and challenges during implementation. On the device side, the company has adapted smart meters to low-power, low-cost applications and reduced their dependence on the network. On the cloud side, Goldcard has invested countless resources to innovate device connection management; process the massive quantities of data generated and collected by smart meters; eliminate performance bottlenecks; and minimize security risks.



“Digital platform technologies have helped Goldcard reduce the cost of smart gas applications, better understand user needs, and comprehensively forecast gas-pipeline operations, which will eventually create value for consumers and provide a solid foundation for the digital transformation of gas and utilities.”

— Maggie Wang, Executive Vice President,
Goldcard Smart Group



The use of digital platform technologies, such as the IoT and big data, has helped Goldcard reduce the cost of reading gas meters, enhance meter-reading accuracy, and increase its understanding of user needs. Digital platforms have strengthened the company’s ability to comprehensively forecast gas-pipeline network operations, and, in particular, the emergence of NB-IoT has been good news for smart gas applications. In terms of devices, the NB-IoT’s wide range of connections, low cost, and low power consumption are perfectly suited to gas meter reading applications. Huawei’s OceanConnect IoT public cloud platform provides many powerful tools for connecting, managing, and securing IoT devices. Application developers can access these tools to build complex upper-layer services that create value for consumers and provide a solid foundation for the digital transformation of gas and utilities.

As the gas industry transforms digitally, it is essential that Goldcard has a mature platform to provide support. First, it is difficult for any single company or sector to harness digital platform applications, such as the IoT and big data, in a comprehensive or successful way. Enterprises need to cooperate with at least one powerful ecosystem partner. Second, Goldcard hopes to use the successful implementation of smart gas solutions as an entrée into other sectors — for instance, into security alerts for smart homes. This would also require the involvement of other device partners to create new sources of value through multi-dimensional, cross-sector integration, such as with cloud data platforms. Besides this, Goldcard

has been expanding into overseas markets for the past two years, and hopes to bring its smart gas meter reading solutions to the rest of the world. Huawei is helping to promote Goldcard products globally, especially in countries along China’s ‘Belt and Road Initiative.’

Huawei offers mature digital platform technologies and has been committed to ecosystem construction for many years. Over the past four years, Goldcard has received valuable assistance from Huawei — including technical support, a deep understanding of the service provider’s needs, and a range of cooperative business models. Huawei has also diligently worked to certify Goldcard’s end products and complete solutions, especially in terms of safety and performance.

Goldcard believes Huawei digital platforms provide excellent functionality, and in the future hopes relevant vertical industry experts from Huawei, such as in the smart home connectivity field will communicate with the company to better understand its needs. Relevant teams within Goldcard have already made technical preparations in the area of big data applications, though in terms of business models, the company needs to further explore how to create new value, improve business practices, and find success stories that serve as reference cases. Huawei has extensive cross-industry experience and can help provide council in this area. When it comes to cross-sector expansion, the IoT is borderless. With the help of Huawei’s platform and ecosystem partners, Goldcard hopes to extend into other domains — from smart gas to smart homes, smart cities, and more.

Shenzhen University: A New Smart Campus Experience

Shenzhen University (SZU), originally founded in 1983, is also known as the ‘Special Economic Zone University,’ ‘Window University,’ and ‘Experimental University.’ Over the past 36 years, SZU has garnered recognition from around the world, and boasts a list of alumni that includes business leaders Ma Huateng (Tencent Holdings Limited), Zhou Haijiang (Hongdou Group Co., Ltd.), and Shi Yuzhu (Giant Interactive Group).

SZU has always attached great importance to technology-driven innovation and is committed to becoming one of China’s ‘Double First-Class’ universities that supports student-centered teaching methods through the use of technologies like cloud computing, big data, and artificial intelligence.

The goal of SZU’s smart campus is to build a modern university that satisfies the teaching, research, and social needs of both teachers and students.

- **Smart Campuses Improve Management Efficiency and Safety**

Since the turn of the century, SZU has responded positively to China’s national call to build ‘universities without walls.’ However, with the growing popularity of e-Commerce and delivery services throughout the country, innumerable package and freight deliveries enter and leave the campus on a daily basis. Campus security needs to be assured in the face of this free flow of people and vehicles, and manned security stations, alone, have been insufficient. So, SZU decided to improve its





“Shenzhen University and Huawei have collaborated to build a smart campus to harness advanced digital communication platforms; including a cloud data center, and an agile network to efficiently connect and integrate multiple campuses. The result is a future-oriented information infrastructure for teaching and research.”

— Qin Bin, Deputy Director, Information Center, Shenzhen University

safety protocol by combining staffed checkpoints with cutting-edge technology.

In 2016, SZU installed the Huawei Smart Campus solution during the construction of its new Xili Campus. The university deployed 740 high-definition cameras supported on the back-end by an intelligent license-plate recognition system that monitors the flow of cars and trucks on campus; and a third-party face recognition platform that identifies students, staff, and visitors entering and leaving dormitories, buildings, and laboratories.

The Huawei Smart Campus technology has greatly improved security and safety at SZU. For example, theft rates have been reduced, which were previously common in public places, such as libraries and restaurants. And campus administrators are now able to direct emergency operations from a central monitoring room — like during typhoon Mangosteen in 2018 when a tree fell across a roadway and the exterior stairs of a building were damaged. For both situations, emergency personnel were dispatched immediately to the exact locations to assess the damage and begin repairs.

Smart Campuses allow people, cars, and physical facilities to be managed intelligently, which in turn makes administration more efficient and the environment safer. Centralized management reduces the need for manpower while enhancing security.

- **Digital Platforms Create Crucial Infrastructure for Teaching and Research**

With the completion of the Xili Campus, SZU began to operate three

campuses across more than 10 kilometers; for which a Huawei-provided optical transmission network was used as a guaranteed, high-bandwidth Local Area Network (LAN) to interconnect the three campuses.

Huawei was also commissioned to build a first-class data center on the Xili Campus to support the expected reductions in cost from improvements in the efficiency of operations and maintenance. The result is a crucial component of SZU’s information infrastructure that is designed to provide continuous, long-term support for the school’s future.

The Huawei ICT platform includes an agile network; data center servers and storage; and on-campus, modular equipment rooms. Interactive classrooms incorporate smart recording systems that track teacher and student interactions and automatically turn lessons into video courseware. The Huawei Smart Campus solution provides SZU with an advanced environment for teaching, research, and the entrepreneurial development of teachers and students, allowing each group to focus on its respective endeavors more easily.

Huawei is leading the way in the global ICT industry — and because the company’s headquarters are also in Shenzhen, SZU enjoys extraordinary after-sales service. Altogether, there are many reasons SZU selected Huawei to build its Smart Campus. In terms of stability and security, the Huawei solution has performed exceptionally well; and continues to meet the university’s needs for teaching, research, and campus life. SZU looks forward to greater cooperation with Huawei in the future.

Building the CERNET Digital Education Platform

The China Education and Research Network (CERNET) is one of the world's largest education and research organizations. Established in 1994, CERNET now supports more than 2,000 educational facilities in China, including universities, and elementary and middle schools; and more than 20 million users in over 1,600 higher education and research institutions. Internationally, CERNET enjoys high-speed interconnections with academic networks in the U.S., Europe, and the Asia-Pacific region.

From the beginning, CERNET has positioned itself as the primary infrastructure provider for the informatization of China's education sector. Based on an evolving platform, and using technologies that continue to develop rapidly, the nearly 2,000 colleges and universities across the country communicate with each other to explore how to best conduct educational experiments and openly share data with each other.

Through CERNET, not only is it possible to access all the

network-connected schools in China, but the platform also supports access to *eduroam*, the secure, world-wide roaming access service developed for the international research and education community. CERNET achieves a '1 + 1 > 2' effect by encouraging people to pool their strengths across institutions to accomplish assignments previously restricted to single campuses.

CERNET plans to cooperate with Huawei in a range of areas to continually improve the digital education platform. For starters, the campus network infrastructure is already closely linked to Huawei. Many schools have not only deployed Huawei's digital platform hardware, but they have begun working with Huawei at higher levels, such as joint research in network behavior to leverage the multitudes of student and teacher data for better, safer, and more flexible network services.

Focusing on the long-term future, CERNET is cooperating with Huawei to conduct research on technology and application trends for years to come. ▲



“CERNET has partnered with Huawei to expand and improve the digital education platform that connects over 2,000 Chinese institutions with academic networks in the U.S., Europe, and Asia-Pacific regions.”

— Professor Li Xing, Deputy Director, National Network Center, China Education and Research Network (CERNET)



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LEADING NEW ICT

Actively Embrace Change: Digital Platforms Enable Digital Transformation

By IDC China

Challenge: Where Is DX Headed?

Today, some companies are leading the Digital Transformation (DX) race; some are moving upstream; and others have no choice but to passively go with the flow. By analyzing the current status of global enterprises experiencing DX, IDC generated a five-level maturity model outlining the different stages of DX. These stages include digital resistors, digital explorers, digital transformers, and digital disruptors. DX is a business digitalization journey defined by the deep integration of technology and enterprise functions.

Based on four consecutive years of study, IDC found that more than 40 percent of organizations, globally, remain stuck in the first two stages of DX and urgently need to accelerate transformation. The major reasons for this immaturity are as follows:

- **CIOs and business unit leaders fail to align their expectations with DX realities.** First, DX is a long-term program. It will not generate remarkable or direct business value in a short period of time, which can erode confidence in unit leaders. Second, CIOs are confronted with tremendous technological complexities while business unit leaders blindly rely on the adoption of new technologies, resulting in a huge disparity of DX understanding between them.

- **DX is an investment-intensive initiative.** According to IDC estimations, the percentage of investment in Information and Communications Technology (ICT) by the entire organization is a key indicator of its investment in DX. ICT investments account for an average of 0.8 percent of a company's revenue across all industries. Leading organizations generally invest

2.5 to 3 percent of their revenue in the ICT needed for DX.

- **The technological complexity of DX rises exponentially while ICT fails to support effective integration.** IDC estimates that fully integrating new technology into the business operations of any organizations will take three years. Meanwhile, the existing IT department will be unable to keep pace with the rapid emergence of new technologies. At least 10 new technologies have emerged in the past three years that fall under the third IDC Platform (including cloud computing, big data, social, and mobility), as well as six IT accelerators (next-generation security, Augmented Reality (AR)/Virtual Reality (VR), the Internet of Things (IoT), Artificial Intelligence (AI), robotics, and 3D-printing, etc.).

Deconstruction: Improving Digital Capabilities Is Imperative for DX

• Key Factors for DX Success

Companies in various phases of maturity should prioritize actions and follow different paths on their DX journey. By studying numerous DX cases, IDC identified four key factors of DX maturity:

- **Vision and goals:** Vision and goals serve as the fundamental prerequisites and top-level designs for enterprises pursuing DX. IDC views the vision and goals as a company's overriding premise for achieving successful DX, which requires the participation of all staff, including the CEO, COO, CHRO, CTO, and CMO. Leadership, the operation model, work resources, information data, and comprehensive experience should all be designed in accordance with the

Digital platforms fuse technology, aggregate data, and enable enterprise applications by using intelligent digital technology as components, data as a productivity resource, and standard digital services as the output. Digital platforms are indispensable to enterprises during digital transformation.





The vision is implemented and the goals are achieved only when an organization is equipped with relevant digital capabilities optimized for its current development stage; only then can an organization generate value from organizational restructuring and KPI configuration. >>

vision and goals, and evaluated based on DX maturity.

- **Organizational structure:** Organizations at different stages of DX maturity vary in their structural needs, which IDC categorizes as one of four types: the special DX project team, the DX office, the embedded digital business team, and the digital business unit. Most enterprises are evolving toward an embedded digital business structure.

- **KPI:** In addition to reasonable vision, goals, and organizational structure, DX also requires appropriate KPIs. IDC discovered 21 KPIs by studying digital native companies, DX transformers, and those leading the DX movement.

- **Digital capability:** IDC considers digital capability development as the final DX factor. Successful DX relies on the implementation of the DX project and project groups, which directly rely on corresponding digital capabilities. The vision is implemented and the goals are achieved only when an organization is equipped with relevant digital capabilities optimized for its current development stage; only then can an organization generate value from restructuring and KPI configuration.

The IDC survey found that business units and IT directors consider digital capabilities to be key to the future of DX, including the following initiatives:

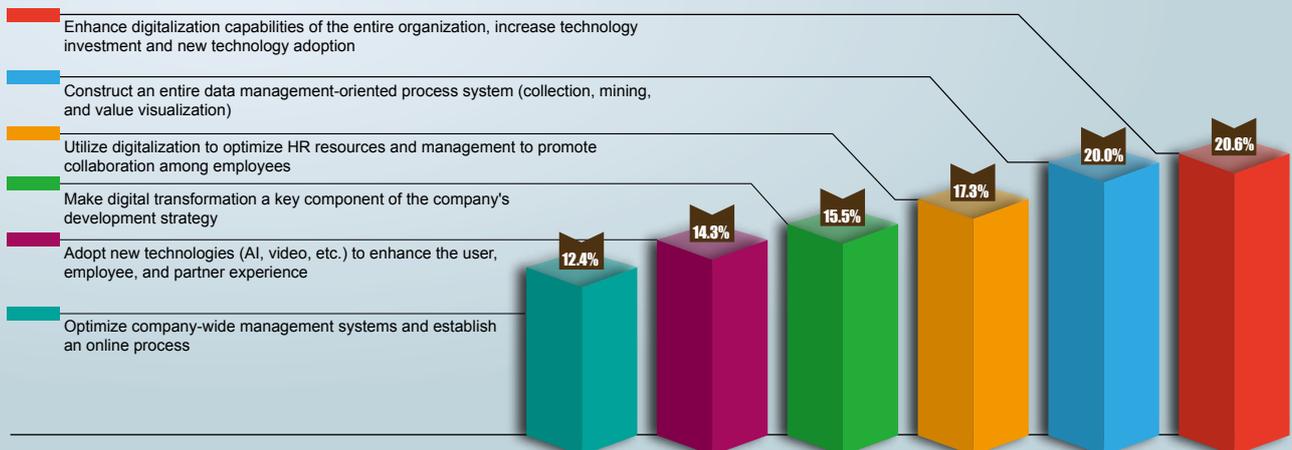
- **Digital Capabilities Drive DX**

An organization needs three sets of capabilities for DX (which can be further divided into 26 core abilities):

- **Digital business innovation and efficient operation** refers to an organization's ability to integrate new technology into its pre-existing business and operations. From a business perspective it includes product and service digitalization, touchpoint customer management, precision marketing and customer profiling, precision services, digital branding, data monetization, and coordinated enterprise ecosystem management. From an organizational operation perspective, it includes a full online management process, a full online production process, full online asset organization, real-time policy support, as well as industry and market analysis.

- **Data intelligence and value regeneration** refer to an enterprise's ability to manage, govern, and mine

Future DX Initiatives





IDC's survey found the most desired digital capabilities among enterprises are the ability to adopt and integrate new technologies (13.1 percent); the ability to create innovative products and services with new technologies (12.9 percent); and ICT scheduling and management flexibility (12.2 percent). >>

value from the full volume of data generated throughout its complete lifecycle. It can be subdivided into the ability to integrate with external data; collect, store, analyze, model, and govern data; and data security.

- **Digital technology management and integration** refers to the efficient management of digital technology introduced into an organization. It includes a resilient infrastructure, service-based component decoupling, service operation and management, new technology introduction, API management, technology security, as well as development and operation.

IDC's survey found the most desired digital capabilities among enterprises are the ability to adopt and integrate new technologies (13.1 percent); the ability to create innovative products and services with new technologies (12.9 percent); and ICT scheduling and management flexibility (12.2 percent).

Transition: DX Requires the Support of Next-Generation I³ System Features

- **Platform Adoption Is Inevitable**

The history of DX is one of interaction and integration between new technologies, business, and management processes. Over the last decade, new technology has become more closely integrated with business and processes as the development of applied technologies has accelerated. This has led to a deeper level of business and management process transformation.

IDC believes that enterprises must build a next-generation system featuring I³ to support the development of digital capabilities.

- **Integration — new technology protects existing investments:** There are three levels of integration. First is integration with an existing

system. In the last two decades of DX, many enterprises made huge investments in, and procurements of, digital technology including devices, software, hardware, and services. During the system unification process in 2018, compatibility with existing systems was the premise of any investment in DX. Second, the platform should integrate with emerging technology. The last decade witnessed waves of new technology disrupting and restructuring digitalization, resulting in repeated investment and construction. Therefore, another important factor to consider is compatibility with cloud computing, big data, video technology, the IoT, and other new technologies. Third, the new platform should integrate with external digital services. As the interface of the digital platform communicates with other organizations, it must be able to quickly access external digital services.

- **Intelligence — data-based intelligent core:**

The new platform must have three aspects of intelligence. First, the platform should structure capacity around the entire data lifecycle to support the collection, integration, processing, storage, use, and deletion of data. Second, the platform should build capabilities for processing, integrating, and sharing full column data comprehensively, including a company's historical data (e.g., ERP); data collected using new technology (video, sensors, etc.); and online data (customer profiles, etc.). Based on the above two aspects of intelligence, the third is mining data for value. IDC believes data-based value generation is achieved in two ways. One is an on-demand real-time digital service provided by the smart platform that has gained intelligence through its operations. The other is the smart output of best practices and

models that can be reused in the mining process. The three aspects of intelligence described above will play key roles in building the next-generation platform.

- **Inheritability — the core of the system is strengthened with the passage of time:** In an age of rapid changes, we should pursue a stable system core and strengthen its capability to manage the ever-changing environment. Over the next decade, the deep integration of emerging application technology and business will lead to the explosive growth of digital products, services, and models. IDC believes the next-generation system should have a decoupling feature and flexible properties. Enterprises must identify timeless core functions through decoupling, and build upon them to protect technology investments. This is a key consideration for the next-generation system.

- **Digital Capabilities Require a Unified Platform**

As IDC's survey shows, it is necessary for enterprises to build a support platform for DX that can converge and integrate new technologies like the IoT, cloud, big data, AI, and security. The platform must provide extensive connections, facilitate business coordination and agile innovation, and empower business innovation through deep integration. The platform should be flexible enough to address changing business needs and support the enterprise DX.

The study also found that enterprises attach great importance to digital platforms, scoring 8.1 in the evaluation (scores are out of 10, with 1 representing least important and 10 most important). Given a company's need for DX and the trend of ICT development, digital platforms have become an indispensable tool for an enterprise during DX.

Game Changer: Digital Platforms Provide Digital Capabilities and Address Uncertainties

- **Defining a Digital Platform**

A digital service center fuses technology together, aggregates data and enables enterprise applications by using intelligent digital technology as components, data as a productivity resource, and standard digital services as the output. The service center drives business innovation and efficient operation; empowers data management and value generation; and simplifies technology operation and management.

- **Intelligent digital technology as components:** With cloud

computing, big data, video technology, the IoT, AI, next-generation security, and other emerging technologies serving as its core components, the digital platform fuses existing technology together while introducing new technologies to the company. Through comprehensive integration of new and existing technology, the platform embeds the organization's technological capabilities within the platform and empowers business development and operation.

- **Data as the production resource:** On one hand, the interdependence of data and the digital platform means different scales and types of data require the support of different digital platforms. On the other, digital platforms in different stages of maturity can handle different scales and types of data. While processing the data, the platform accumulates industry-specific experience, which gradually helps build a smarter platform and develop smarter export capabilities.

- **Standard digital services as the output:** A digital platform provides API-based standard digital services that access the Internet, devices, applications, and other platforms in a standard way. Digital platforms not only facilitate business development and operations within the organization, but also develop into a new form of digital service that differentiates itself from competitors.

- **Structure of a Digital Platform**

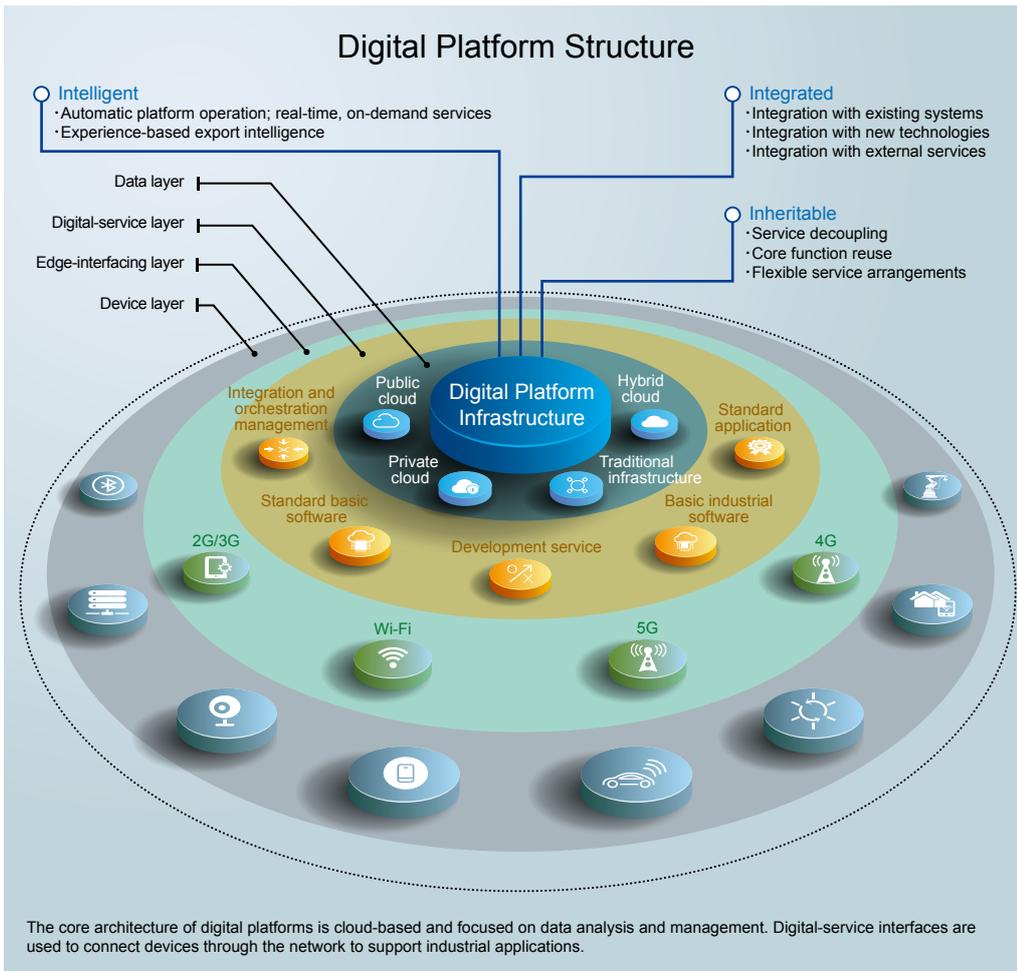
The core architecture of the digital platform is cloud-based, focuses on data analysis and management, and uses a digital service as the interface that supports industrial applications by connecting with devices through the network.

- **Value of a Digital Platform**

- **Supporting applications and empowering business for the future:** The construction of digital platforms will provide flexibility for application development, which will allow application management to catch up with business changes and cope with multiple business demands.

- **Providing standard digital services and empowering ecosystems for the industry chain:** By integrating new technologies, the platform provides digital capabilities for the upstream and downstream enterprises in the industry chain. Partners and suppliers can produce and provide services through a unified platform.

- **Forging digital intelligence through data assets:** The platform helps mine the value of full-volume and full-lifecycle data, and




Through the establishment of digital platforms, enterprises will benefit from data integration, data intelligence, digital operation, application empowerment, and integrated ICT infrastructure. >>

continually accumulates data models through best practices and industry benchmarks. It helps build data resource pools and unlocks untapped data value.

• **Integrating new technology through technological operation and management:** The platform provides companies with efficient infrastructural operation and management, and further realizes the vertical synergy between platforms, networks, and devices.

Through the establishment of digital platforms, enterprises will benefit from data integration, data intelligence, digital operation, application empowerment, and integrated ICT infrastructure.

The platform accumulates full-volume business data, which helps to support decision-making and business model innovation (15 percent), cope with the changing needs of consumers in a fast and flexible way (12.7 percent), build more integrated

and smarter ICT infrastructure (11.9 percent), release organizational resources through capacity transfer, and further focus on business innovation (11.9 percent).

• **Typical Digital Platform Analysis**

Currently, there are three main types of digital platforms on the market: giant Internet vendor-based Type-C platforms; customer scenario-based Type-π platforms; and specific industry scenario-based Type-F platforms.

• **Type-C platform (giant Internet vendor-based):**

This type of platform provides digital capabilities based on its Internet business. Oriented to customer scenarios or application demands, the main functions of the platform are integration and orchestration of application data and functions. The platform is mainly used for application service development and diversified integration, mostly supported by cloud



Various types of platforms will gradually integrate and form a more flexible architecture that offers a wide array of capabilities. Security, innovation, intelligence, openness, standardization, efficiency, and collaboration are the best features of the digital platform. >>

platforms on the backend. Most of these platforms are provided by Internet vendors, which are relatively weak in ICT infrastructure construction, Internet connectivity, and coordination.

- **Type- π platform (customer scenario-based best practices):** This type of platform focuses on building flexible ICT infrastructure and developing management capabilities through cloud-network-application-edge-terminal device synergy. Traditional ICT infrastructures are upgraded and integrated with new ICT resources. This platform can provide a range of capabilities, including data aggregation, integration, sharing, and value exploration. The platform's new technology introduction and integration capabilities are highly valued for supporting application development in accordance with customer needs. A relatively weak understanding of industry is the main challenge of a Type- π platform. However, through the accumulation of best practices and cooperation with industry partners, the functions and contents will gradually diversify.

- **Type-F platform (specific industry scenario-based):** This type of platform targets a specific industry and provides support for industrial applications. It requires an in-depth understanding of industrial applications and a rich accumulation of industrial experiences to realize specific industry values. However, the limits of such a platform have become obvious with the emergence of cross-industry consolidation.

With the constant development and evolution of business and management demands, various types of platforms will gradually integrate and form a more flexible architecture that offers a wide array of capabilities.

Security, innovation, intelligence, openness, standardization, efficiency, and collaboration are the best features of the digital platform.

Practice: Leading the Development of Digital Platforms

- **Huawei Digital Platform**

Huawei is committed to building safe, innovative, smart, and open digital platforms for enterprise DX. The platforms offer capabilities that include monitoring, operation, maintenance, and security management. They help enterprises connect and manage applications and data through the unified coordination of cloud, network, application, edge, and terminal devices.

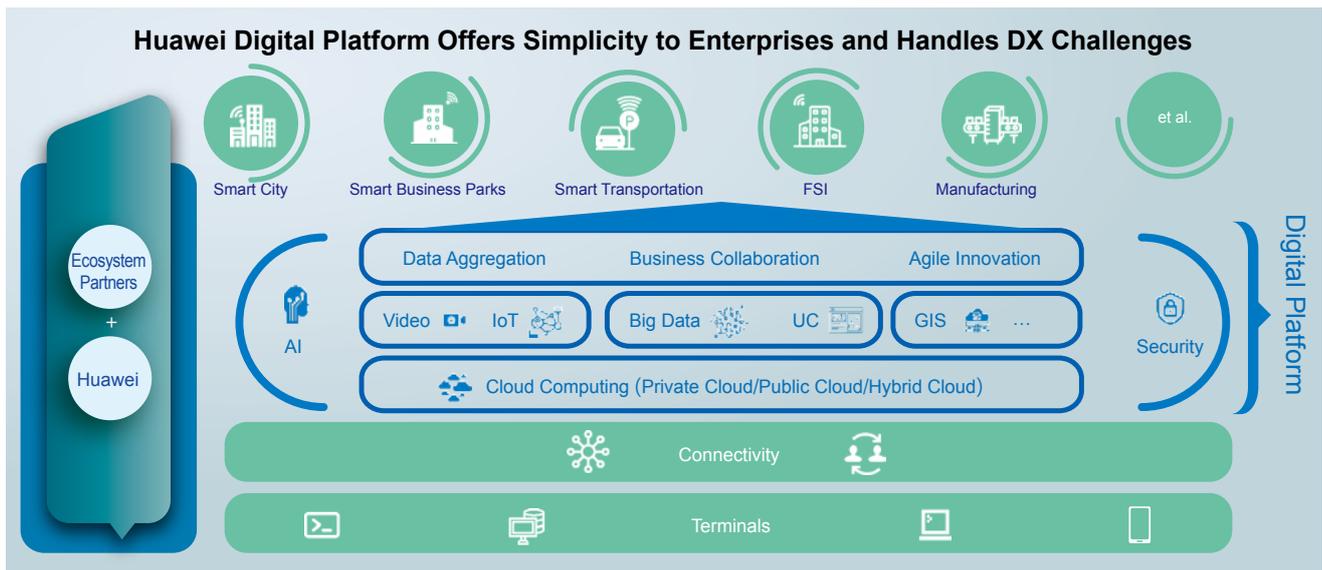
By leveraging AI and other new technologies, Huawei's digital platforms help enterprises build new ICT capabilities. The end-to-end solutions that the platforms provide enable enterprises to establish data connection, full-volume data sharing, and data mining for value. This eliminates data silos and provides intelligent support for business decision-making. The platforms introduce new technology while maintaining compatibility with existing IT systems; facilitate smooth upgrades and transformations; drive the openness of the IT architecture; and diversify the capabilities of IT systems. Huawei digital platforms support the development of digital capabilities for enterprises in three aspects: improvement of data-related capabilities, development of new ICT capabilities, and industrial empowerment.

- Eliminate data silos between all departments and develop industrial scenario-based data modeling, data analysis, and value exploration capabilities. The platforms aggregate, integrate, and analyze heterogeneous data from multiple sources to establish unified full-volume data as a foundation for value exploration and sharing.

- Develop new ICT capabilities by integrating new technologies. The platforms introduce new ICT capabilities while inheriting existing ones. By connecting a company's internal and external



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systems, Huawei's platforms achieve service-based capability integration, coordination, and sharing.

- Manage infrastructure efficiently and achieve vertical coordination of platforms, networks, and devices. Huawei's platforms enable industry application development, iterative empowerment, and the promotion of digital business innovation.

- Additionally, Huawei digital platforms provide full-stack AI solutions and end-to-end security mechanisms that enable security control and AI for application development in operational and industrial scenarios. The digital platforms will act as key DX drivers.

- **Case Study: Digital Platforms for Digital Transformation**

Huawei digital platform best practices act as a reference for the industry, help enterprises realize their digital transformation goals, and promote enterprise development.

- **Shenzhen Airport: AI-Optimized Business Processes Improve Efficiency**

Based on the construction of future airport digital platforms, Shenzhen Airport has analyzed its problems and challenges. By establishing business scenarios and setting development goals, the airport has built a digital platform framework of unified infrastructure, unified data architecture, and unified data. The integration of the IoT, big data + AI, video cloud, GIS, and Integrated Communications Platforms (ICPs), in combination with business scenarios, has enhanced the airport's digital capabilities. Shenzhen Airport promotes its digital transformation and facilitation as 'great operation control, great security, and great service.'

- **China Merchants Bank: Implementing Data Intelligence,**

Innovating Business, and Enhancing Experience

China Merchants Bank (CMB) is the first commercial bank in China that is completely owned by corporate legal persons. In 2018, China Merchants Bank ranked 213th in the *Fortune Global 500*. CMB started pursuing digital transformation in response to its business innovation needs and pain points. CMB's digital transformation efforts include establishing a philosophy of digital transformation and formulating specific measures; providing enterprises with the ability to collect, share, and discover the value of data through digital platforms; promoting the integration of data intelligence with business scenarios to empower business innovation; integrating new technologies like AI to enhance the bank's sharing/management capabilities; and optimizing business processes to improve operational management efficiency.

- **Yanbu, Saudi Arabia: Digital Transformation Helps to Realize Sustainable Development**

Saudi Arabia released its *Vision 2030* strategy in 2016, aiming to transform the nation through sustainable development. The Royal Commission for Yanbu, a future city under the *Vision 2030*, launched the Smart Yanbu Industrial City initiative during the same period, hoping to combat challenges with digital transformation. With the goal of enhancing municipal administration and leveraging digital capabilities empowered by Huawei, Yanbu has successfully built a solid digital infrastructure network, and achieved digital transformation and sustainable development with the help of smart city applications. These applications have improved municipal administrative efficiency, enhanced public safety, and created a better living environment. ▲

Five Key Points for Building Platforms and Driving Cooperation

By Zheng Zhibin, President, Global Smart City Business Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

In recent decades, China has achieved an unprecedented rise in the rate and scale of urbanization, partially due to the positive capabilities of ICT. In a recent speech, Zheng Zhibin shared his thoughts on the key technologies needed to build platforms, drive cooperation, and enable Smart Cities for the modern age.

1. China Has Increased Its Urbanized Population by Nearly 40 Percent Over 40 Years

After a series of reforms in the 21st century, China increased the proportion of urbanization by a factor of three (from less than 20 percent to nearly 60 percent) from 1975 to 2018. This is astonishingly fast when you consider the size of China's population. In comparison, it took hundreds of years for the U.K., the U.S., France, and other developed countries to achieve a similar proportion.

Many economists characterize China's urbanization as a miracle of the 21st century. We are proud of this feat, but it has given rise to

many problems, and we now face the following challenges:

- City infrastructure fails to support social development
- Public services do not meet residents' needs
- City information is not fully integrated or shared

Further, the urbanization process has spawned a variety of issues like traffic congestion, air pollution, medical and educational resource shortages, 'garbage sieges,' frequent public safety incidents, and land-use conflicts. These issues are not unique to China, but are common in most developed countries; however, given the size of China's population, resolving these issues is uniquely challenging.





Huawei built a basic platform to aggregate data and share capabilities — and upper-layer applications can use these capabilities to accelerate development.

2. Digital Transformation Is Fueled by ‘Customer + Business + Architecture’ and ‘AI + Big Data + Cloud’

As a technology, products, and solutions provider, Huawei recognizes that China’s demand for Smart City planning and development requires the rise of a new era for information technologies.

At present, many technology giants across the world are championing digital transformation. Technology and informatization are powerful enablers and promoters of digital transformation, but what are the fundamental driving forces?

Digital transformation is driven by two concerns — business and technology. Specifically, it is a V-shaped model:

- The first line is **Customer + Business + Architecture (CBA)**, with a focus on citizen benefits and propelling economic growth through customer-centric business practices.
- The second line, **AI + Big Data + Cloud (ABC)**, is the standardized technical architecture developed on the first line with a focus on driving business development.

The two lines progress and coexist concurrently with one another. However, Huawei prefers to use CBA as the primary measure and ABC as a supplement directed at the development and promotion of the Smart City ecosystem and the quality of life improvements that follow.

3. AI-enabled Facial Recognition Creates Value in a Range of Scenarios

Artificial Intelligence (AI) technologies create different values in

different scenarios. Facial recognition is a hot-topic technology that offers a range of application scenarios. We have even deployed facial recognition systems at Huawei’s main campus.

Facial recognition technology not only provides social and economic benefits, but also plays a vital role in Safe City operations by ensuring safety and maintaining social stability.

The three scenarios below reveal the benefits of combining business with technology, per the CBA and ABC initiatives described above:

- **Scenario 1 – Job attendance:** Facial recognition accurately monitors employee attendance, eliminating the need for employees to scan company badges in and out of work.
- **Scenario 2 – Security:** New barrier gates allow employees to enter buildings based on facial recognition, which takes less than 1.5 seconds and eliminates the need for fixed security guards, saving roughly USD 14,600 (CNY 100,000) per year per guard, or USD 1.46 million (CNY 10 million) per year for every 100 security guards.
- **Scenario 3 – Schools and classrooms:** Facial recognition cameras can be placed at school gates and classroom doors. The cameras can immediately identify students entering and exiting the campus, and then send SMS messages to their parents.

The economic and social values of each scenario can be estimated and monetized, but how can we measure the impact that the technology is making in specific scenarios? And, how do we invest resources into new technologies to further maximize the social and economic benefits?



4. Use the 'Platform + Ecosystem' Strategy to Develop a Sustainable Ecosystem on a Unified Digital Platform

As demonstrated in the case of Gaoqing's hazardous chemical supervision network, cutting-edge technologies are required when the objective is to improve the management of industrial chemicals.

Huawei began work on the Smart Gaoqing project by developing application scenarios in 10 domains, identifying the commonalities between scenarios, and designing an open architecture based on the CBA. The service divisions were specified to give full access to every person.

We determined that various service requirements in Gaoqing's Smart City scenario needed common resources, such as the Internet of Things (IoT), which supports hazardous chemical detection. In addition, big data support, full-domain video surveillance, command and dispatch systems, and Geographic Information System (GIS) services are all common needs.

A basic platform was built to aggregate data and share capabilities based on these elements, and upper-layer applications use those capabilities to accelerate development.

This is the 'unified digital platform' we deployed in Gaoqing County.

5. Cities Need Innovative, Open Ecosystems Similar to Smartphones

We can use the evolution of mobile phones to better understand Smart City development.

Traditional feature phones were not smart, and vendors uniformly provided closed-system products to end-users.

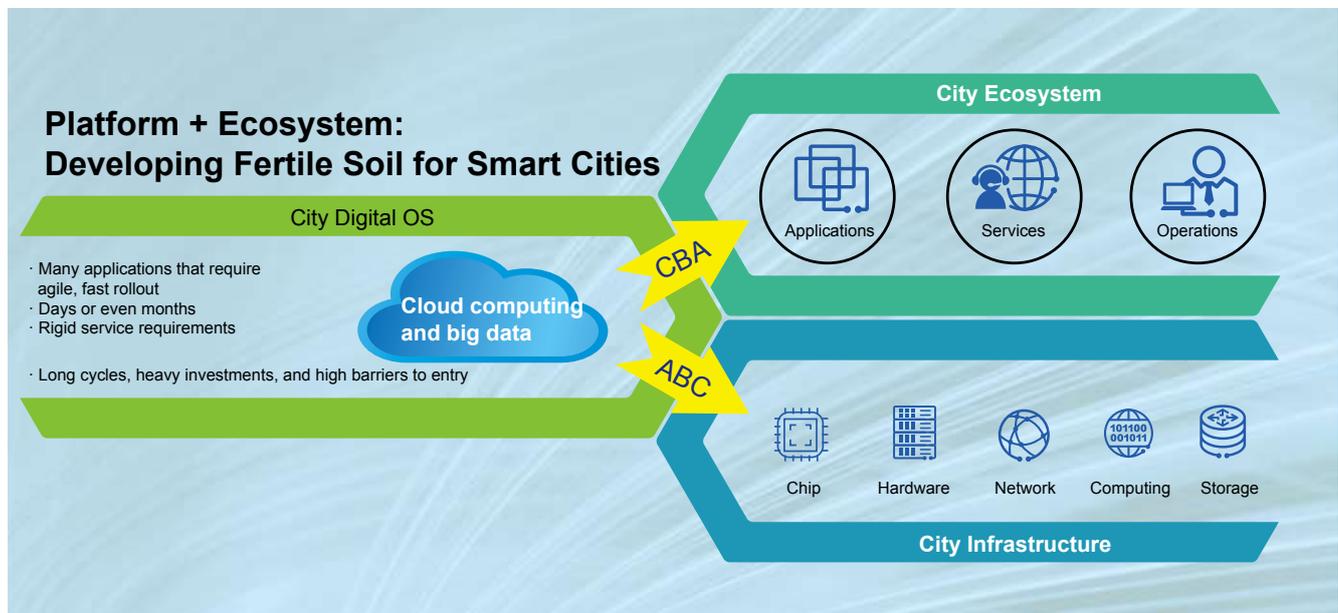
Apple and Google, however, have disrupted the worldwide mobile phone industry by developing smartphones that include open interfaces that encourage third-party developers to participate in the market.

'Smart' phones are the result of powerful processing capabilities and rich software platforms that greatly expand the field of applications. Smartphone vendors need not provide these specific functions themselves, because they allow developers to independently innovate applications in the smartphone ecosystem.

The diversity of third-party smartphone applications and the success of the 'natural selection' mechanism has long exceeded the expectations of the vendor community where an application's value is decided by end users in a competitive ecosystem.

These changes in the consumer sector are also emerging in the enterprise and government markets.

If we compare a Smart City ecosystem to the smartphone





Cities vary greatly. In all cases, residents, businesses, and visitors need to have agile, fast, and innovative applications. The digital transformation of cities is propelled by the urgent requirement for architectural innovation throughout their ICT-based Smart City infrastructures.

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ecosystem, the Information and Communications Technology (ICT) infrastructure for each city is analogous to smartphone handsets and the systems to which they connect. Both feature strong performance, robust computing and storage resources, and high-speed network connections. The digital Operating System (OS) for each city is open and standardized like a smartphone OS. City application systems have diverse needs, and the best outcomes occur when the efforts of all social forces are combined. Ripe to adopt the same properties of natural selection as are seen in the mobile telephone market, Smart City ecosystems promote the creativity of entire societies.

Cities vary greatly. In all cases, residents, businesses, and visitors need to have agile, fast, and innovative applications. The digital transformation of cities is propelled by the urgent requirement for architectural innovation throughout their ICT-based Smart City infrastructures.

Traditional innovation chains feature long development cycles, including the example of smartphones: Vendors identify requirements and contact integrators who transfer them to software developers. Software developers create services and bring technical requirements to hardware developers. Hardware developers assess and accept the requirements, initiate development, and then deliver

the hardware. Software developers then develop and deliver the software. Such a long period cannot meet the demands of a Smart City.

The bottom-level of hardware innovation requires heavy investment and long periods for development. For example, advanced silicon chips routinely take three or more years from design to production. Engineering projects at this scale create risk and require continuous investment.

Smart City OSs are currently updated once or twice a year. However, large numbers of upper-layer applications require rollouts that are rapid and agile. Development periods are often reduced to months, or even days. Huawei's goal is to empower all social forces throughout the industry chain to pursue innovation. Though the needs of government and industry may vary greatly, the specific needs for each is addressed through a robust ecosystem that boosts platform innovation.

Users select from a growing diversity of Smart City applications provided by developers that operate independently of the system vendors. The value of such applications is driven by popularity, and the developers should be rewarded to ensure continuous iterative improvements. In this way, we are building a Smart City ecosystem that maximizes the impact of urban digital transformation. ▲



Digital Technologies + Intelligence: The Highway for Connecting Cars to the Future

In the past decade, the automotive industry has made huge strides in connected cars and the Internet of Vehicles (IoV). Developments like live traffic information, media ignition, remote ignition, vehicle tracking, and navigation services have all become commonplace. But the biggest changes — and challenges — for connected vehicles lie ahead.

By 2023, worldwide sales of connected cars will reach 72.5 million units, up from 24 million units in 2015, according to IHS Markit, an industry consultancy. This means that in just over eight years, more than two-thirds of passenger vehicles will be exchanging data with external devices.

The connected vehicle cannot operate without communication technologies. Based on network connections, information can flow within the vehicle, between vehicles, between the vehicle and the road it is traveling on, and between the vehicle and the cloud — handling scenarios such as changes in traffic lights and driving conditions.

“In the future, connected vehicles will be able to interact with the automobiles and infrastructure around them,” George Westinghouse Electrical and Computer Engineering Professor at Carnegie Mellon University Raj Rajkumar said. “The most exciting development will be when vehicles can communicate with traffic lights and other surrounding vehicles.”

Digital Highways

Some of this is already happening. Using ad-hoc mesh Wi-Fi or technologies like Cellular Vehicle-to-Everything (C-V2X), vehicles can keep informed of the changes in traffic lights and communicate their intentions with other vehicles, to better avoid collisions. For example, technologies for connected vehicles have been applied to government vehicles and roads in Colorado. The Colorado Department of Transportation plans to equip 2,500 of its government

vehicles with C-V2X and Dedicated Short-Range Communications (DSRC) technologies by the end of the year and expects 4 million vehicles to be ‘talking’ to each other and the roadway infrastructure within 10 years.

In China, the wide coverage and technical advances of cellular networks provide the basis for C-V2X to become widely adopted by the government as a key enabler of connected vehicles. Nine provinces have embarked upon the digitalization of their highways, with the purpose of using C-V2X to connect 90 percent of the nation’s highways by 2020.

Huawei is working with Chinese and European cities — including Barcelona, Spain; Hanover, Germany; and London, England — to deploy C-V2X traffic solutions globally and facilitate autonomous driving.

But this is just the beginning. Further connecting cars, pedestrians, and roadway infrastructure will bring safer roads, more efficient engines, and richer experiences for both drivers and passengers. Digital technologies such as Artificial Intelligence (AI) will play a greater role as these interactions become smarter. Carmakers will be able to monitor their vehicles in a real-world environment, tweaking the driving experience and coupling it with machine learning.

Driving Interaction

AI will improve the interaction between humans and vehicles by understanding and anticipating the driver’s needs and movements. After the construction of 5G networks, complex and data-heavy



Further connecting cars, pedestrians, and roadway infrastructure will bring safer roads, more efficient engines, and richer experiences for both drivers and passengers. Digital technologies such as Artificial Intelligence will play a greater role as these interactions become smarter.

scenarios involving multiple vehicles, roads, and other elements can be assessed with AI.

“This new branch of the Internet of Things (IoT) will spawn business opportunities we haven’t dreamed of,” Raikumar said. “Connected vehicles may quickly become the IoT’s biggest revenue generator.”

The hardware and services for connected vehicles are expected to reach values of up to USD 156 billion by 2020, according to a report from The Boston Consulting Group (BCG) in 2017. The number of active fleet management systems — a measure of the demand for connected commercial vehicles — is also growing. More than 10.6 million management systems, covering light and heavy commercial vehicles, are expected in Europe by 2020, up from just 2 million in 2010.

This means there will be massive volumes of data passing to and from connected cars. Data will interact between vehicles, vehicles and pedestrians, and vehicles and roadway infrastructure. Other data

will be transmitted over cellular networks.

Mass data from connected vehicles will impose huge demands on the network. According to DERKA, a company focusing on the safety of human interaction with technology, a connected car will generate 25 GB of data per hour. Intel, the chip vendor, says that autonomous driving will generate about 4 TB of data per day, which is equivalent to the data traffic consumed by almost 3,000 people.

“The network is the essential foundation for the communication among vehicles, infrastructure, and humans,” Teralytics CEO Alastair MacLeod said. “In the future, the network needs to support billions of newly connected devices, cars, and infrastructure, with fast and reliable connectivity.”

While some of this can be handled by existing LTE networks, much of the promise of connected cars will only be realized when 5G networks are rolled out. This could be soon. The 5G standards were completed in mid-2018 and some networks and devices will be rolled out by the end of the year. 5G networks will reduce latency

The highway for connecting cars to the future will depend on data, AI, and connectivity:

- According to IHS Markit, by 2023, worldwide sales of connected cars will reach **72.5 million** units. This means that more than two-thirds of passenger vehicles will be exchanging data with external devices.
- The Colorado Department of Transportation expects **4 million** vehicles to be ‘talking’ to each other and the roadway infrastructure within **10** years.
- In China, **9** provinces have embarked upon the digitalization of their highways, with the purpose of using C-V2X to connect **90** percent of the nation’s highways by 2020.
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and improve reliability — key to enabling vehicles to communicate with a range of entities around them.

“5G networks enable cars to transfer great amounts of data in real-time,” well-known IT industry consultant and Global Automotive Center of Competence member Juri Deuter said. “Also, it allows direct peer-to-peer communication. Countries that take the lead in adopting 5G standards will have a great advantage in the whole mobile market.”

The Final Destination

The ‘holy grail’ is for cars themselves to become Autonomous Vehicles (AVs). The industry divides the advancement of autonomous driving into five levels. On the first two levels, AI assists cars, but humans are the ultimate authority. Antilock

brakes and adaptive cruise control have achieved partial automation, but still require humans to intervene. The industry reached these first two levels comfortably and is now nearing level 3, according to Tom Koulopoulos, a futurist and founder of the Delphi Group.

“We are approaching what is one of the most critical inflection points,” Koulopoulos said.

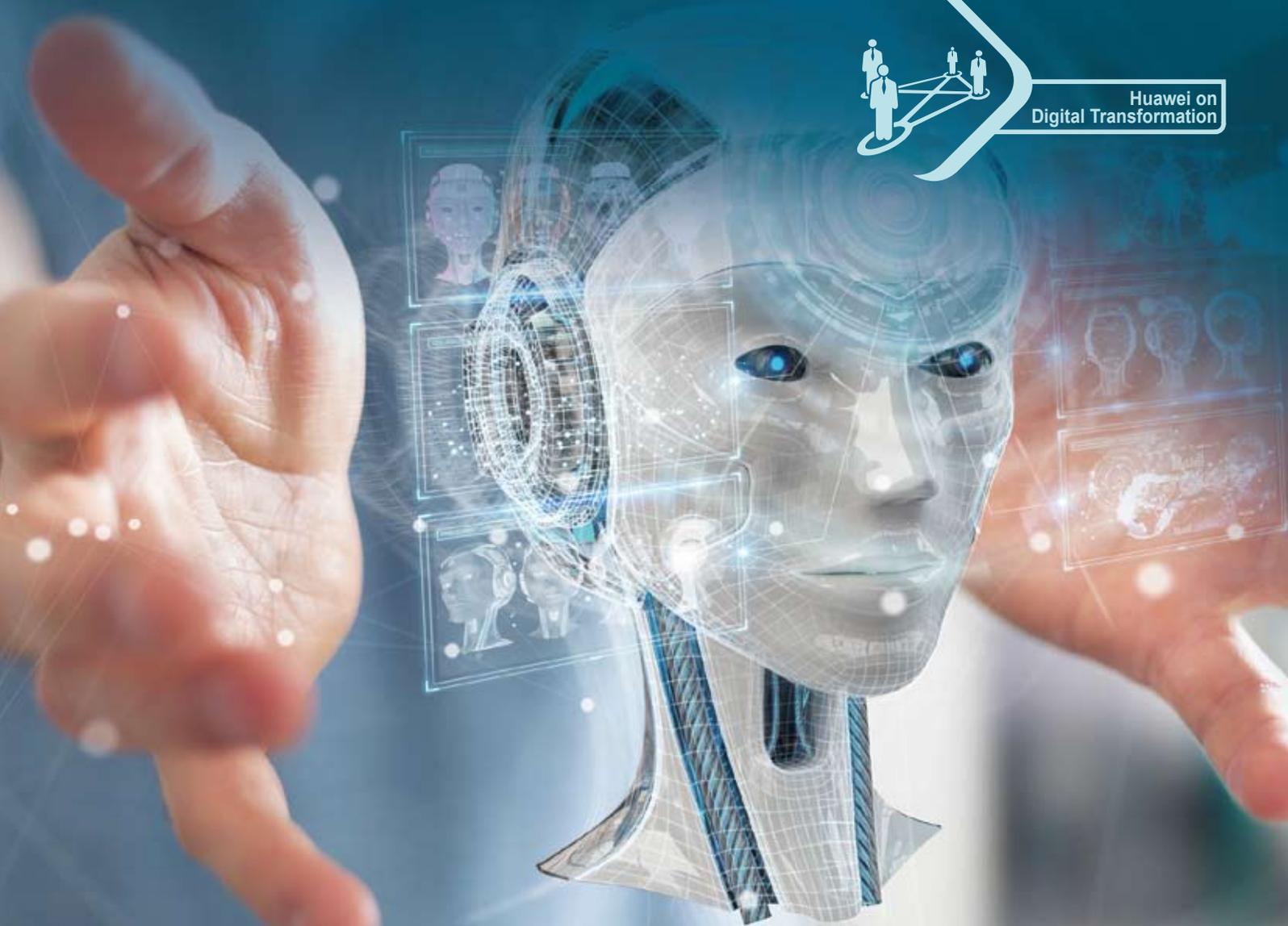
Level 3 is where the vehicle can be controlled by either the autonomous driving system or humans with a seamless shift.

“The challenge with level 3 is that we hold the AV to a much higher standard than we do human drivers,” Koulopoulos said. “For that we need better AVs, which means we need better AI. And, in the case of AVs, AI is still somewhat embryonic.”

The prerequisite for implementing a level-3 AV is to promote AI applications in digital technologies, with a focus on machine learning and its subset, deep learning, according to Huawei. Advances in AI, especially deep learning, have propelled the automotive industry toward autonomous driving, giving new impetus to the traditional industry. Once these advances are achieved, Huawei believes the industry will reach levels 4 and 5, where the computer is responsible for the car, with a seamless connection between the vehicle and its surroundings.

“Even if that holy grail is some ways off, the car’s dependency on data, AI, and connectivity has already been established,” Deuter said. “With the adoption of IoT and 5G networks, more data will be available and actionable, while most data lost its value within seconds in the past. Therefore, if you are able to feed the AI application with more accurate and precise data using less time, the application will improve and more use cases will be possible.” ▲

Source: *The Economist*



+AI, Accelerating Collaborative Public Safety

By Hong-Eng Koh, Global Chief Public Safety Scientist, Enterprise Business Group, Huawei Technologies Co., Ltd.

Collaborative Public Safety

In 2016, Huawei was among the pioneers in promoting the need for public safety agencies to embrace digital transformation, which we call ‘Collaborative Public Safety.’ In essence, due to the evolving nature of threats against public safety and other operational challenges, agencies are unable to overcome these threats and challenges alone. It is no longer business as usual. Agencies, even across cities and countries, need more collaboration. The leading technologies also allow the introduction of new organizations, processes, and services to better protect public safety. More importantly, just like the digital sharing economy, agencies need to leverage platforms to reach out to communities and collaborate with them in preventing, detecting, responding to, and recovering from

threats. In 2017, Huawei even launched its suite of ‘Collaborative – Command & Control, Communications, Cloud, Intelligence, Surveillance and Reconnaissance’ (C-C4ISR) capabilities and solutions to enable Collaborative Public Safety.

It is heartening to see more consulting and technology companies, and even public safety agencies, promoting the need for public safety digital transformation.

Use Cases of AI in Public Safety — The Seven A’s

Digital transformation may seem luxurious and out of reach for many agencies. But with the changing landscape, one either transforms or faces digital disruption. Public safety agencies need to accelerate their adoption of Collaborative Public Safety.

AI is more than just an ICT project. Agencies need to use the ‘seven A’s framework’ to prioritize requirements and desired outcomes. Agencies need to consider seven areas during the ICT implementation of AI projects: connectivity, big data, computing power, enabling platforms, cyber security, continuous innovation, and the industry ecosystem.

Is Artificial Intelligence (AI) the key to accelerating public safety digital transformation? The short answer is yes. But there is too much noise, and indeed confusion, to overcome before an agency can truly benefit from AI implementation. For AI implementations to be practical and beneficial, we need to look at different angles that start with the basics. From a technological angle, we need to understand that AI can be applied at different technical layers. On the Internet one can find many articles on the use of AI in public safety, but they tend to be too prescriptive. The only common denominator between different public safety agencies, especially across countries, is their mission statement. Very often, the laws empowering them, their organizations, their procedures, their people, their technological systems, and their budgets, are different.

What we need is a generic framework of actionable use cases for different public safety agencies to plan their AI roadmap based on their legal authority, resources, requirements, and desired outcomes. I propose the use of the ‘seven A’s framework’ for public safety AI use cases.

This framework does not represent a mandatory seven-step process that public safety agencies need to embark upon to implement AI applications; nor does it represent capabilities that need to be followed sequentially. What it does is rank the difficulty of implementing AI applications from ‘Analyze’ to ‘Automate.’

- **Analyze:** The most basic and easily achieved processes, from analyzing textual data to photos to video to audio, and even to sensor data. Such analysis creates textual conversions, descriptions, and tagging of the data items being analyzed.

- **Automate:** Public safety involves many routine procedures that can be automated through AI applications. Examples include daily crime report generation, skill-based officer deployment, crime scene

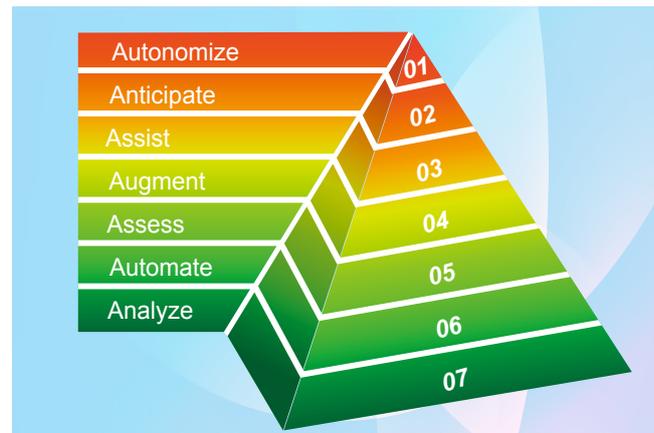


photo classification, investigation summary and facts publication, and vehicle roster generation.

- **Assess:** This is where AI implementation starts to get interesting. This capability is beyond individual data item analysis; it involves the assessment of the bigger picture. It is beyond knowing what occurred and when; this assessment needs to address why and how something happened. Such as why a series of similar crimes were committed in a neighborhood, or how a person is radicalized to support terrorism.

- **Augment:** While laws govern nearly all public safety works, many decisions have to be made by frontline officers based on their situational assessment, knowledge, and experience. This is why AI is called Augmented Intelligence in a few industries. It complements rather than replaces human intelligence. It is about helping humans become faster and smarter at the tasks they are performing; for example, providing daily reports of crime prone areas, and alerting patrol officers to the presence of known criminals in those areas.



Huawei has the most complete selection of connectivity technologies, both wired and wireless, to connect to a wide variety of data sources, and the industry's largest petabit core routers to manage huge volumes of fast data. >>

- **Assist:** AI assistants are able to communicate with humans via natural language. Using the same example as ‘Augment,’ assistants can suggest patrol routes, places to visit, and people to check out based on priorities, urgent dispatches, and cost-benefit analysis.

- **Anticipate:** The use of AI applications to anticipate and predict crime, riots, disasters, traffic accidents, and even the whereabouts of suspected criminals.

- **Autonomize:** It’s not exactly RoboCop, but rather a system that includes software applications, drones, vehicles, and robots, that operates autonomously.

This ‘seven A’s framework’ serves as a generic model of actionable use cases for public safety agencies to think about while designing their AI applications.

Seven Implementation Considerations

AI is disrupting existing business models and creating new opportunities for global public safety. To date, more than 230 cities in over 100

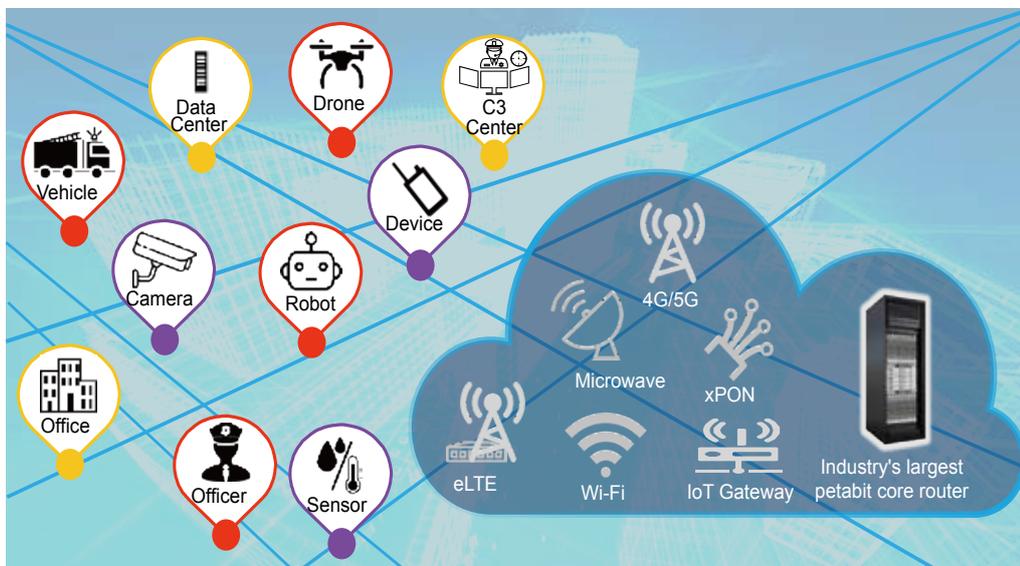
countries have deployed our public safety solutions. What’s more, an increasing number of cities have introduced AI technology into their solutions.

AI is more than just an ICT project. Government agencies need to start with a vision and implementation roadmap — think big, start small, and use the ‘seven A’s framework’ to prioritize requirements and desired outcomes. Agencies need to consider these seven areas during the actual ICT implementation of AI projects: connectivity, big data, computing power, enabling platforms, cyber security, continuous innovation, and the industry ecosystem.

- **Connectivity**

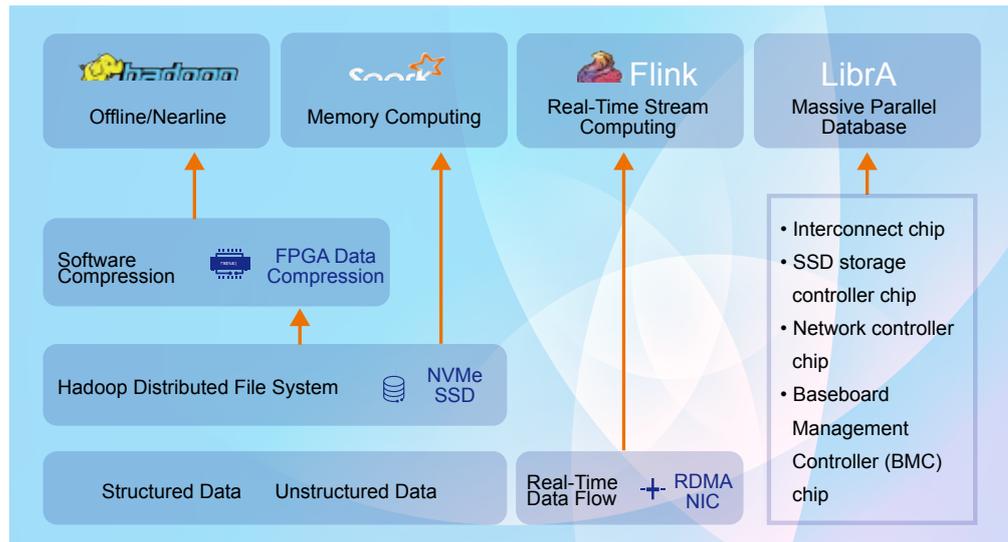
While often overlooked, connectivity is crucial. Just as the five human senses collect ‘data’ before the brain makes a decision, AI systems need different data sources for better processing. Connectivity, especially wireless for mobility, is also necessary to allow AI systems to transmit instructions to devices.

Huawei has the most complete selection of connectivity technologies, both wired and wireless, to connect to a wide variety of data sources, and the industry’s largest petabit core routers to manage





Big data requires high-power computing. Because AI is essentially data-driven, the output needs to be calculated quickly and accurately. Not all hardware systems are created equally, and Huawei's specialized hardware supports the four scenarios. >>



huge volumes of fast data.

• **Big Data**

AI can be realized through rule-based hardcoding or machine learning, which can learn through decision trees, inductive logic, and deep learning. The common denominator for all techniques is the demand for high-volume, high-velocity, and high-variety big data.

Huawei's FusionInsight big data platform offers an extensive suite of services, including Hadoop, Spark, Flink and LibrA. The platform even has its own 200+ data models/algorithms specifically for public safety, allowing partners and customers to rapidly develop their own applications. This platform is good for four scenarios:

- Offline/near-line computing of large data sets with fewer requirements for low latency
- In-memory computing with moderate requirements for low latency
- Real-time stream computing with strict requirements for low latency
- Massive structured data analysis

• **Compute Power**

Big data requires high-power computing. Because AI is essentially data-driven, the output needs to be calculated quickly and accurately. Not all hardware systems are created equally, and Huawei's specialized hardware supports the four scenarios detailed below: offline/nearline storage,

memory computing, real-time stream computing, and massively parallel databases.

In addition to Huawei's hardware innovations, the FusionInsight big data platform can run on Huawei's cloud technologies for better resource pooling (computing, storage, and network), and easy, flexible, on-demand self-services.

• **Enabling Platforms**

In a way, AI applications are limited only by one's imagination, and public safety agencies can leverage the 'seven A's framework' to conceptualize and prioritize such applications. We need enabling platforms to make it easier for AI applications to be developed rapidly, without having to worry about hardware integration and performance, or needing to seek out and connect to data sources. We also require common components without having to code them into the applications. The result is Huawei's suite of C-C4ISR platforms that enable Collaborative Public Safety.

These platforms together with partner applications are not meant just for big cities. There are tens of thousands of cities with populations less than one million. Not only is the safety of such mid-size cities important, but we need access to all levels of data to provide accurate insights for an effective AI program. This is why Huawei offers its Safe City Compact solutions for mid-size cities. Safe City Compact can also be used in other scenarios.



With more than 6,000 professionals directly supporting Huawei's public safety solutions, including many with frontline public safety operational experience, we are in a good position to help design the architecture for AI implementation. >>

In Kenya, Safe City solutions based on visualized critical communications and AI technologies helped the police shorten their response time by 60 percent, reduce the annual crime rate by 46 percent, and improve overall security. As a result, local tourism developed rapidly, growing 14 percent in 2016. In Mauritius, an AI-enabled intelligent video cloud solution greatly improved video analysis efficiency for public safety incidents. The solution also helped optimize traffic management and reduce traffic accidents. In Pakistan, a Safe City solution based on intelligent image technology was used to construct a license plate recognition system for automobiles, with a 90 percent recognition rate in daylight; and the time for terror cases reduced from 45 days to 2 days, with average incident response times shortened from 30 minutes to 10 minutes.

• **Cyber Security**

Due to the massive volume of sensitive data, public safety agencies have to take extra precautions to safeguard their cyber security. Any data leak is sure to breach privacy protection and lower public confidence. Worse still, data manipulation can lead to undesirable and even incorrect AI outcomes. Huawei takes security very seriously, as evidenced by our cyber security strategy and approach, especially the Integrated Product Development processes designed by IBM to assure the cyber security of Huawei products — where independent security verifications are carried out from product conceptualization and development to lifecycle maintenance. Separately, Huawei offers an AI-based unified security solution to detect, predict, and mitigate cyber threats.

• **Continuous Innovation**

AI adoption is a journey that must leverage continuous innovation to achieve the best outcomes. According to the World Intellectual Property Organization, Huawei was the top company in 2017

globally and across industries in terms of patent applications — with 4,024 to be exact. The second place company applied for 2,965 patents. Not long ago, Huawei launched two AI-related products: a Software-Defined Camera and an Intent-Driven Network Switch.

• **Industry Ecosystem**

One company alone cannot implement AI. It needs an entire ecosystem. AI implementation needs to follow open standards to prevent vendor lock-in and ensure interoperability. Huawei is glad to support and adopt more than 30 open standards, and we have more than 1,000 partners providing applications on our platforms. These partners are supported by our OpenLab facilities around the world.

As a leading ICT company, Huawei's capabilities include a complete AI portfolio and a full stack of technologies to cover all scenarios, from devices and connectivity to cloud platforms. The technologies include:

- Ascend series of specialized AI chips; based on a unified, scalable architecture
- CANN chip operations library and automated development toolkit
- MindSpore unified training and inductive framework for device, edge, and cloud
- Application enablement for end-to-end services (ModelArts), multiple-level APIs, and pre-integrated solutions such as the public safety solutions behind our C-C4ISR capabilities.

With more than 6,000 professionals directly supporting Huawei's public safety solutions, including many with frontline public safety operational experience, we are in a good position to help design the architecture for AI implementation. Not just technology architecture, but also business architecture, data architecture, and application architecture. ▲

Combining Digital Platform and AI to Build Future-Ready Shenzhen Airport

By Zhang Huai, CIO, Shenzhen Airport Group

I was honored to speak at *Huawei Connect 2018* and enjoyed seeing so many people gathered there. In fact, the scenario reminded me of Shenzhen Airport on a busy day: When large numbers of flights are delayed, more than 8,000 passengers will be stuck waiting away from their homes and offices at the same time. So how should the airport respond to this situation? I believe the solutions for Shenzhen Airport and other airports around the world will be realized using new technologies, such as Artificial Intelligence (AI).

Shenzhen Airport has been developing at a rapid pace, as is the case with the city of Shenzhen as a whole. In 2016, at a time when business travelers were estimated to account for 50 percent of its total traffic, Shenzhen Airport was selected as the world's best airport by the Airports Council International (ACI). Passenger volume reached 45 million in 2017, with the number of passengers estimated to have reached 50 million in 2018, with cargo volume exceeding 1.1 million tons. Shenzhen Airport has become the core transportation hub of China's Greater Bay Area.

A Future-Ready Airport to Support the Greater Bay Area

Managing and controlling multiple runways and terminals is inherently complex and a daily challenge for Shenzhen Airport. We had long explored and tested solutions to the problem, but our information department acted in response to business demand, rather than pre-empting business needs.

In 2017, the International Civil Aviation Organization (ICAO) chose the Shenzhen Airport site to build a worldwide showcase for future-ready airports. The first reason why Shenzhen Airport was



The goals of Shenzhen Airport are to become a global leader in airport operations and to support the development of the Greater Bay Area by focusing on three major aspects — security, efficiency, and passenger experiences. The airport is working with Huawei to fulfill these goals, access new technologies, and implement AI innovation engines to build a future-ready digital platform.

selected is that our business scenarios and operational complexity are widely representative of many airports; and second, Shenzhen boasts a large number of science and technology enterprises that would be interested in contributing to the showcase.

Our goals are to become a global leader in airport operations and to support the development of the Greater Bay Area. Specifically, we are focused on three major aspects:

- **First, proactive security assurance:** Over 30 percent of risks can be identified using digital platforms. By implementing digital technologies we expect to rank third in security assurance among all Chinese companies.
- **Second, efficiency within a limited space:** We expect to shorten aircraft turnaround times, reach an on-time release rate of 85 percent, and reduce the taxi time for each aircraft by one minute.
- **Third, we intend to improve the passenger experience through the use of end-to-end services;** Shenzhen Airport has plans to achieve a 15 percent decrease in time spent waiting in line, and a more than 30 percent increase in the rate of self-service baggage drop-offs.

Enabling a Future-Ready Airport through Innovation

To fulfill these goals, we began to work with Huawei to access new technologies and AI innovation engines.

Huawei and Shenzhen Airport are following the ‘Platform + Ecosystem’ strategy to build a future-ready digital platform. Based on Huawei’s Information and Communications Technology (ICT) infrastructure, the two parties have integrated the Internet of Things (IoT), big data + AI, video cloud, Geographic Information System (GIS), and Integrated Communication Platform (ICP) resources. In

partnership with other vendors, we are building a platform-based ecosystem in which AI is playing an important role. For example, AI big data is used for applications such as knowledge graphs, machine learning, and natural language processing. AI vision utilities include facial and human body recognition, vehicle identification and tracking, and panorama stitching. The ICT platform is delivering operational control, security, and passenger services to the airport.

- **Operational control:** Intelligent and efficient Aeronautical Operational Control (AOC) and intelligent resource allocation
- **Security:** Proactive, intelligent security assurance and collaborative emergency management
- **Passenger services:** End-to-end, personalized, visualized, connected, self-service amenities

Intelligent and Visualized Flight Services

The goal of Shenzhen Airport management is to deliver intelligent, visualized flight services. Jointly with Huawei, we have spent a year on projects using technology innovations to improve the efficiency of airfield operations:

- **Intelligent stand allocation:** Based on big data and AI, the utilization of contact stands has been optimized to reduce the number of passenger shuttle buses. Today we have increased the direct boarding rate by a minimum of 10 percent, which eliminates the need for shuttle buses in 100 out of every 1,000 flights and delivers a better experience for passengers.
- **Smart airfield ground lighting:** Based on the IoT and AI, individual light control, flight path planning, and conflict detection expedite taxiing before takeoff and after landing. For busy airports,



In the future, Shenzhen Airport will continue to work with ecosystem partners such as Huawei to deliver scenario-specific services, manage scenarios on the platform, and open platforms to the ecosystem. We will build a world-leading future-ready airport by focusing on security, efficiency, and the quality of the passenger experience. >>

the time between flight landing to passenger unloading can be 20 minutes or longer. If this time can be reduced by 20 percent, three to four minutes can be saved for each flight. In scenarios of 1,000 flights per day, up to 67 hours can be saved in addition to contributing to energy conservation and environmental protection.

- **Visualized ground operations:** Video and AI technologies enable automatic information collection from IoT-connected sensors embedded across the airfield. The system conducts comprehensive computer-vision analytics and supervisory operations. In the past, all such activities were done manually and at higher risk.

Delivering an Efficient Airport Experience

Apart from providing intelligent and visualized flight services, we have also performed joint innovation in regard to passenger trips. Future-ready airports will improve travel efficiency and provide better travel experiences with self-service check-in, self-service baggage drop-off, multi-layer security checks, smart Flight Information Display Systems (FIDSs), facial recognition identification for boarding, last calls, and VIP services. Our goal is to implement self-service resources, such as information access, that are based on AI-assisted video (i.e., facial recognition), passenger route/flow analysis, and wait time analysis resources that are enabled by digital connectivity between passengers and airport facilities, and between the airport and airlines.

Regarding security screening, we understand that most passengers are reliably nonthreatening, and heightened measures are only required for a limited number of passengers. Based on this background, we discussed the possibility of simpler security screening with the General Administration of Civil Aviation and other official institutions.

A differentiated-classification security screen is currently implemented at Shenzhen Airport — a process that we continue to refine.

Our goal is to provide facial recognition services through big data analysis for all passengers entering and leaving Shenzhen Airport. Facial-image-based access control eliminates the need for manual passenger identification and reduces the amount of time spent waiting in lines.

Innovation at this scale requires a comprehensive plan. Therefore, we have worked with ecosystem partners such as Huawei to promote the development and construction of a future-ready airport. We have taken 1.5 years to streamline business scenarios in a simplified manner and integrate the infrastructure, data architecture, and data platforms. To be specific, we implemented an overall plan — including a top-level design, architectural model, and data governance policies; performed joint innovation to manage uncertainty, iteration, and ecosystems; and drafted enterprise and industry standards for a future-ready airport showcase.

On August 28, 2018, a Beijing Capital Airlines flight to Macao made a successful emergency landing at Shenzhen Airport. The pilots' decision to divert to Shenzhen is a testament to the industry's trust in our future-ready facilities. We believe that with further application of innovative technologies, we can do even better.

In the future, we will continue to work with ecosystem partners such as Huawei to deliver scenario-specific services, manage scenarios on the platform, and open platforms to the ecosystem. We will build a world-leading future-ready airport by focusing on security, efficiency, and the quality of the passenger experience. ▲

From Zhang Huai's keynote speech at HUAWEI CONNECT 2018



Cloud Brain Platform Simplifies IT O&M

By Hu Gang, Deputy General Manager, Application and Operation Support, Information Technology Center, Pacific Insurance Group

The cloud brain represents a new application of Artificial Intelligence (AI) technologies for IT Operations and Maintenance (O&M). High-availability, high-performance information systems have long been the most important research direction in the O&M field. Recent years have seen frequent calls for intelligent O&M applications that can quickly locate the root causes of faults, predict capacity risks, and properly configure resources. The emergence of cloud computing has improved the ability of O&M activities to resolve pressing problems in enterprise information system management.

O&M Pain Points

• Scenario 1: Fast Fault Locating

When faults occur, centralized alarm systems generate large numbers of alarm messages that are sent to O&M engineers through various channels, resulting in flooded screens and annoyed users.

Once a fault alarm is received, O&M engineers will process each message one by one, access the corresponding server, and search the run logs. With a 30-minute target to locate and resolve the fault, O&M engineers face mounting pressure with each passing minute. As business personnel track the process and demand quicker troubleshooting, O&M engineers face hundreds or even thousands of scattered alarms.

• Scenario 2: Predict Capacity Risks

Business departments often need to perform O&M activities at unpredictable times. When required, the departments can request IT

O&M services anytime and anywhere. Even with an extremely tight deadline, the IT department must work properly.

Upon receiving a new request, the O&M team will quickly complete system checks in accordance with the manual of Standard Operating Procedures (SOPs). However, even the O&M director cannot be 100 percent certain that the expanded system can guarantee operation. Both the business and technical personnel strive for a timely and successful resolution to the business activity assurance process. Despite careful preparation, everything becomes meaningless if the system breaks down.

Where is our peace of mind? When are risks eliminated?

Cloud Brain Resolves O&M Pain Points

AI is the cloud brain's core. As defined by Gartner, AIOps stands for Algorithmic IT Operations. They add machine learning and other

Automatic O&M is entering a new phase where machine learning solves longstanding problems based on stored data. The purpose is to improve predictive capabilities and system stability, reduce IT costs, and improve product competitiveness.

algorithmic capabilities to O&M applications. By leveraging existing O&M data (such as logs, and other monitoring and application information), machine learning can solve problems traditional automatic O&M systems cannot, improve the predictive accuracy and stability of the system, reduce IT costs, and improve product competitiveness — all of which lays the foundation for the next phase of automated O&M.

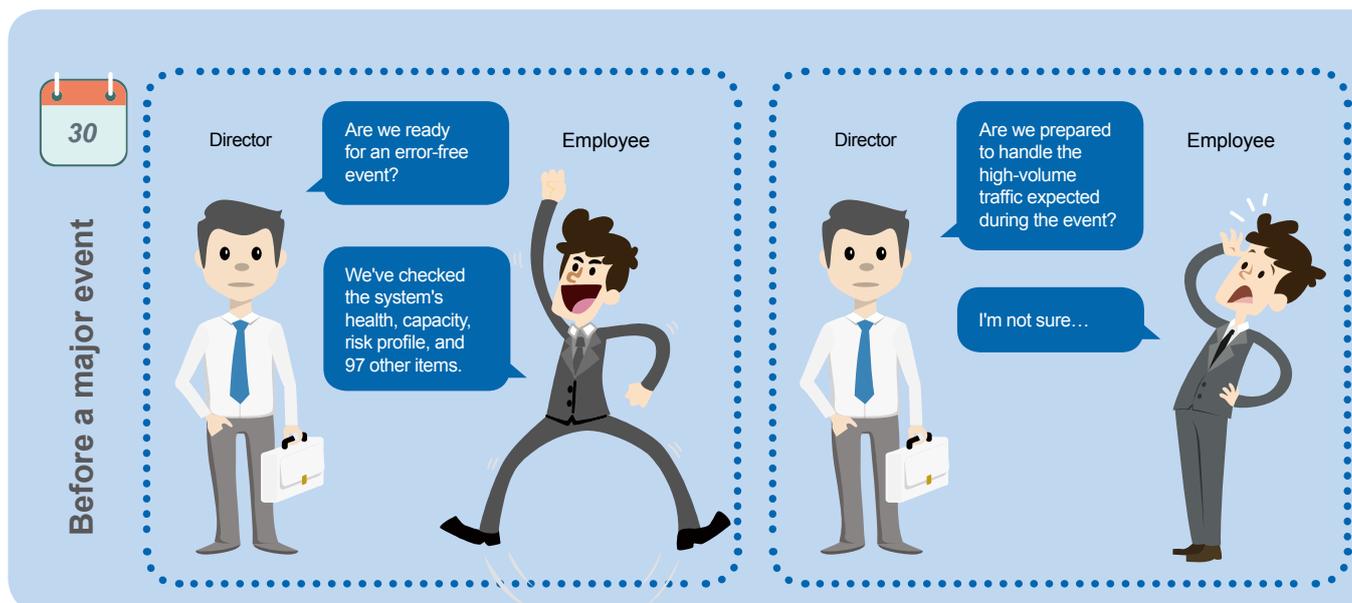
Common AIOps application scenarios include quality assurance, cost management, and improvements in efficiency. In one example, China Pacific Insurance (CPIC) and Huawei collaborated on alarm work order convergence and service trend prediction scenarios.

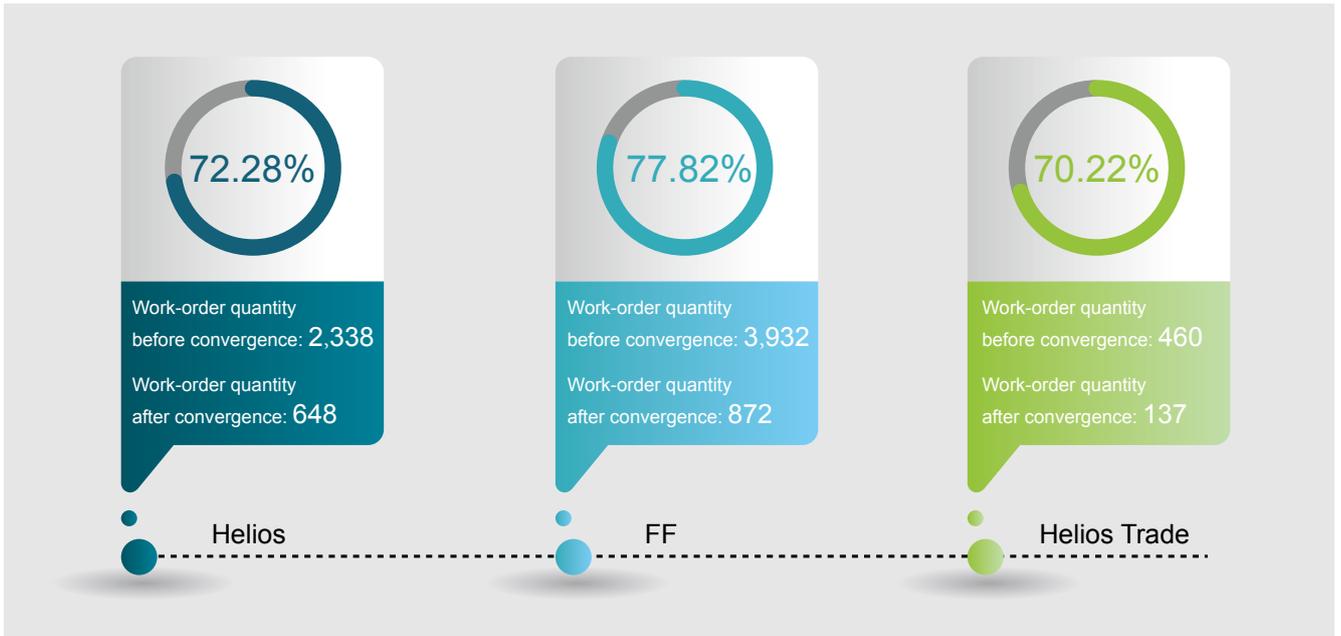
• **AI-Based-Alarm Work Order Convergence — ‘Inside’**

Work order convergence includes offline model training modules

and online work order convergence modules. Offline model training modules perform data collection and preprocessing, feature selection, and model training in sequence; and then work order convergence modules complete work order classification, information extraction, clustering, and root cause analysis.

In recent years, Huawei has been applying AI technologies to reduce costs and improve efficiency, and has gained extensive experience through successful cases in intelligent network and IT system O&M. Our algorithm selection process has leveraged Huawei’s successful experience in AIOps, and adopted machine learning and deep learning algorithms, such as the Long Short-Term Memory (LSTM), correlation data mining, decision trees, and random forest algorithms.





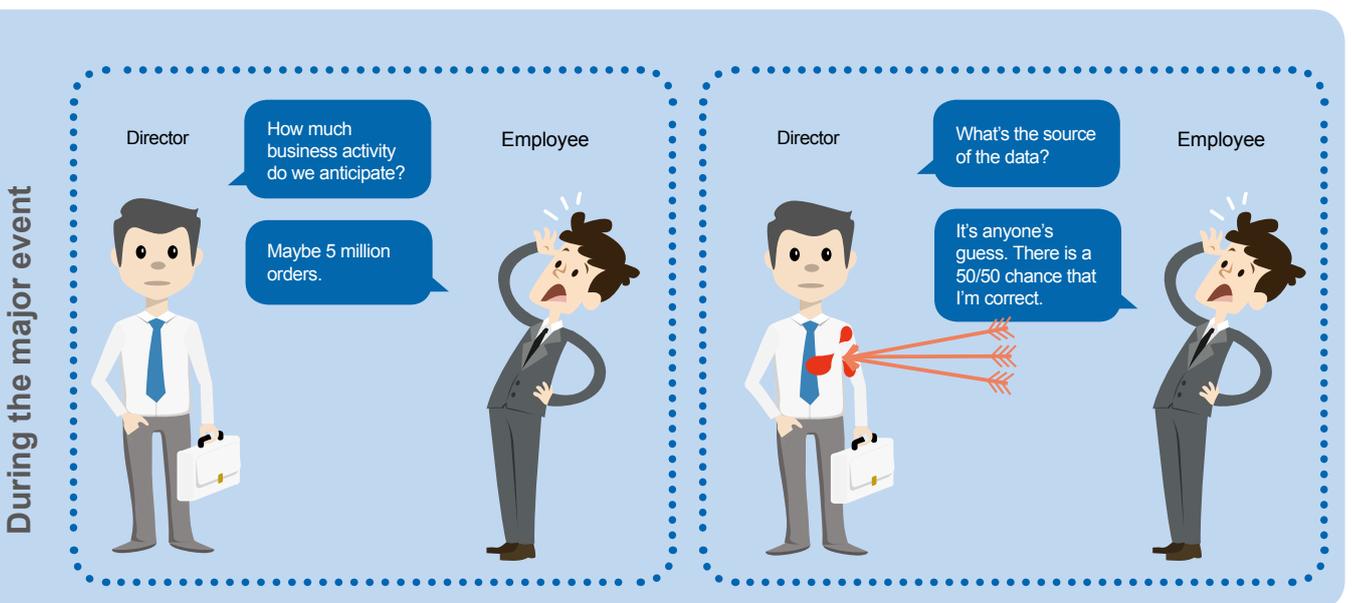
In addition, Huawei optimized algorithm performance and accelerated model generation using open-source algorithms. Huawei also improved the generalization capability and prediction precision of models through algorithm optimization.

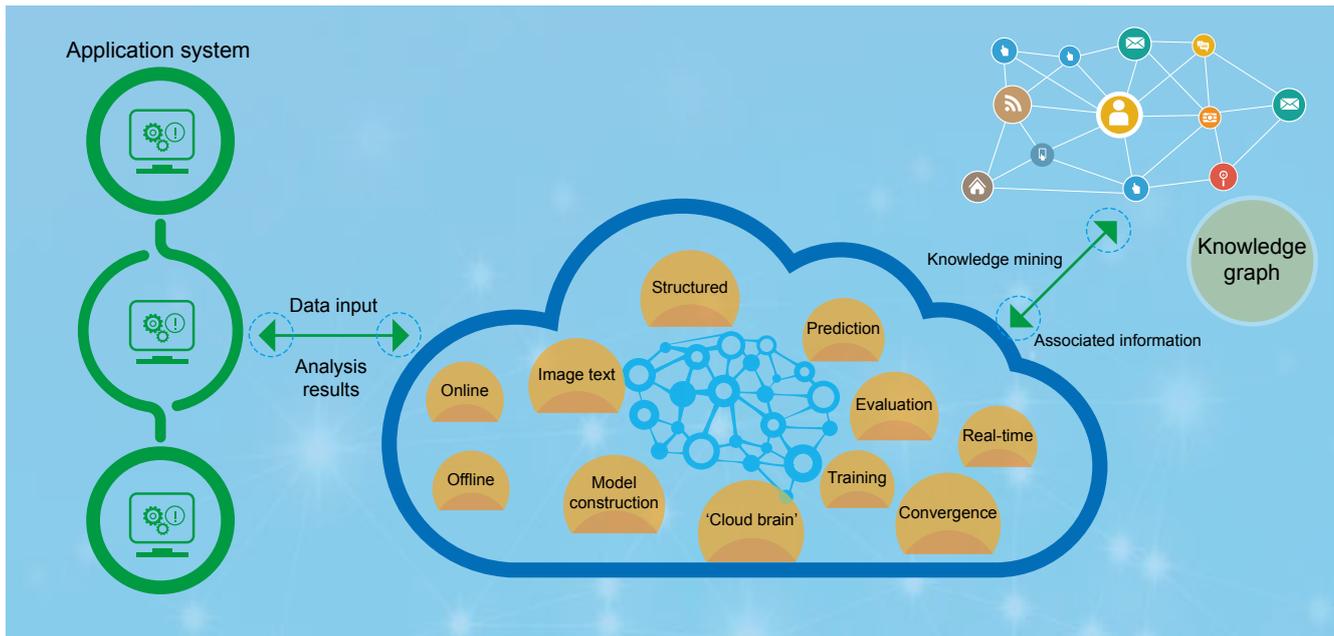
The modeling and verification of this project indicated a 60 to 80 percent decrease in work orders based on the alarm data generated by different service systems. Currently, the convergence rate of alarm work orders exceeds 70 percent. According to O&M engineering

assessments, the accuracy rate of convergence results has exceeded 90 percent.

• **AI-Based-Alarm Work Order Convergence — ‘Outside’**

The cloud brain presents analysis results on an analysis dashboard. After the alarms from each architectural layer are analyzed by the cloud brain, the system outputs the convergence and source tracing results of the alarm work orders. Should a fault occur, the cloud brain makes the entire analysis process highly efficient. O&M engineers





can directly identify root causes and perform troubleshooting operations using the automatic O&M platform, which greatly simplifies the analysis process.

• **AIops Practice: Business Volume Prediction — ‘Inside’**

The key data for predicting business volume includes the number of life insurance issuance orders, vehicle insurance reports, settled automotive insurance claims, underwriting issuance orders, and CPIC life and property insurance calls from 2016 and 2017. The XGBoost, a boosting integration algorithm, was selected as the main modeling algorithm and demonstrated a significant effect on the prediction field.

Based on the XGBoost algorithm, a basic model of 2017 property and vehicle insurance cases was generated, and its prediction of case volume during the Spring Festival, National Day, and Minor Vacation were roughly correct. However, the model was still insufficient. New models were established for each mode using historical data, and the basic model was further adjusted. The result showed that the enhanced model’s error rate was 50 percent lower than the previous iteration.

• **AIops Practice: Business Volume Prediction — ‘Outside’**

The system dynamically predicted a trend toward service and technical personnel in real time through Kanban boards. This helped warn of risks and minimize the impact of service changes on IT resource support. Adopting predictive Kanban boards has become an O&M development trend. As to the Normalized Root-Mean-Square Deviation or Error (NRMSE) — the difference volume/average daily

transaction volume — the cloud brain’s performance reached the reference range with an error rate of less than 30 percent.

Productivity Transformation

After the alarm convergence model has been integrated into the current alarm platform, the system will connect to the automatic O&M platform and implement intermediate processing capabilities like alarm combinations, and fault and correlation analysis. O&M personnel will no longer need to manually review historical alarm information, and root causes will be located quickly and automatically. It is estimated that for every 700,000 alarm work orders in a year, the alarm convergence model will reduce the manual workload by more than seven person-years, and reduce troubleshooting time by 22 percent.

The integration of the trend prediction alarm model into the Kanban platform will facilitate the collaboration between business and IT departments, predict the system capacities required to respond to service changes, create running data archive files, and explore more extended applications.

In the two scenarios, the cloud brain’s model management platform provides online and offline running models with functions like structured and unstructured data processing, as well as image/text recognition. The models are constructed, trained, optimized, verified, and then released. The system can interconnect with other business systems through interfaces. In addition to the current knowledge base, the underlying technologies used for knowledge



Regarding intelligent O&M, the entire industry is still in the exploration stage, and many companies are taking a ‘wait-and-see’ approach before making their foray into the domain. However, there is no outsider when it comes to intelligence. >>

mapping will be upgraded to provide more efficient and accurate results. Huawei’s graph engine products will construct a knowledge graph to provide storage, multi-hop query, and relationship analysis capabilities for high-performance knowledge graph relationships.

Industry Replication and Promotion

- **Cloud Brain Delivery**
- **Kanban board:** Visualized charts clearly display complex processes and data, correctly express data values, and transform the data into ‘user stories’ so that problems can be located and understood quickly. The system can filter details based on user requirements, gain insight into root causes, and provide decision-making capabilities.
 - **Model:** Through application scenario analysis, scenario data can be used to train and select algorithm solutions, and create models. The system sets tracing points, cleans and stores data, and selects features. It can filter out invalid information, minimize uncertainties, mine information, and maximize algorithm performance. Application scenario analysis can continuously measure model intelligence, as well as verify, train, and iterate data until preset requirements are met.
 - **Engine:** The engine enables service personnel to easily and efficiently configure real-time and quasi-real-time decision models and develop rules based on application scenarios. In this way, thousands of decision-making models and rules can be calculated based on massive streams of real-time data that meet the scenario requirements for high concurrency and low latency. Therefore, the engine is programmable, scalable, highly compatible, energy efficient, and elastic.
 - **Interface:** The cloud brain can provide standard interfaces based on actual system

requirements; delivers analysis and reasoning services; and connects multiple platforms to make services faster and more convenient.

- **Cloud Brain Application Scenarios**
- **Inside the industry:** Problem defect convergence, resource usage forecasts, user behavior predictions for insurance customization, cost (claim) forecasts, and fraud prevention through insurance system association.
 - **Outside the industry:** Massive information convergence, logistics forecasts, website traffic forecasts, sales forecasts, fraud prevention through insurance system association, and human flow forecasts.

A Better Future

The cloud brain focuses on essential customer requirements in specific application scenarios and addresses customer O&M pain points. Customers want stable services and smooth user experiences. The cloud brain can help O&M personnel quickly locate faults, repair faults at their source, and resolve problems in a timely manner.

According to Gartner’s analysis, the global AIOps deployment rate will increase from 10 percent in 2017 to 50 percent by 2020. In addition to the Internet, AIOps application domains will include High-Performance Computing (HPC), telecommunications, finance, electric power, the Internet of Things (IoT), health care, aerospace, military equipment, and networks.

Regarding intelligent O&M, the entire industry is still in the exploration stage, and many companies are taking a ‘wait-and-see’ approach before making their foray into the domain. However, there is no outsider when it comes to intelligence.

What is your role in the transformation toward intelligent O&M? ▲



CMB: Retail Banking With AI and Distributed Databases

By Zhou Tianhong, General Manager, IT Department, CMB Head Office

Established in Shenzhen in 1987, China Merchants Bank (CMB) is a leading developer in China's digital banking sector. CMB has been promoting the strategic transformation of 'lightweight banks' in recent years by clearly defining the role of Fintech banks with the aim of transforming itself into a technology-driven bank.

CMB: Opening the Retail Banking 3.0 Era

CMB is focused on retail businesses. It seized the opportunity in the era of 'retail banking 1.0' characterized by bank card services and the 'retail banking 2.0' era characterized by hierarchical wealth management. Today, we believe that CMB is leading the industry into the 'retail banking 3.0' era.

To make 'retail banking 3.0' a reality, CMB needs to do the following three things: First, make the CMB Apps the main platform for banking operations and services. Currently, CMB offers two Apps — the CMB App and the CMB Life App — with over 120 million total users, of which more than 60 million are Monthly Active Users (MAUs). Second, CMB needs to build a service system that covers all products, channels, and customers. And finally, the

bank must continue to provide an unparalleled customer experience.

Advanced banks are adopting data-driven approaches for marketing, service operations, and risk control. CMB operates 137 branches and 1,693 sub-branches in nearly 150 cities in China and serves more than 100 million customers. Our digital banking business-operation system provides strong background support.

Recent years have seen breakthroughs in deep neural network algorithms that are creating explosive development opportunities for Artificial Intelligence (AI). The financial industry has created a number of significant applications by leveraging AI; for example, the use of facial recognition for identity verification in financial service scenarios, or to optimize customer experiences based on past activities. Natural Language Processing (NLP) enables dialogue between humans and

machines and is currently in wide use for intelligent customer services that greatly reduce operating costs.

In addition, machine learning plays an important role in financial risk control. New technologies are changing the IT infrastructure of banks. Three technologies are of particular note; they are: cloud computing, big data, and AI.

CMB Exploration and Practice Using AI

CMB has conducted proactive exploration and practice in AI.

- **Image Recognition:** In October 2015, CMB began to use facial recognition technology to verify account holder identities during ATM withdrawals, which was the banking industry's first use of this technology in China.

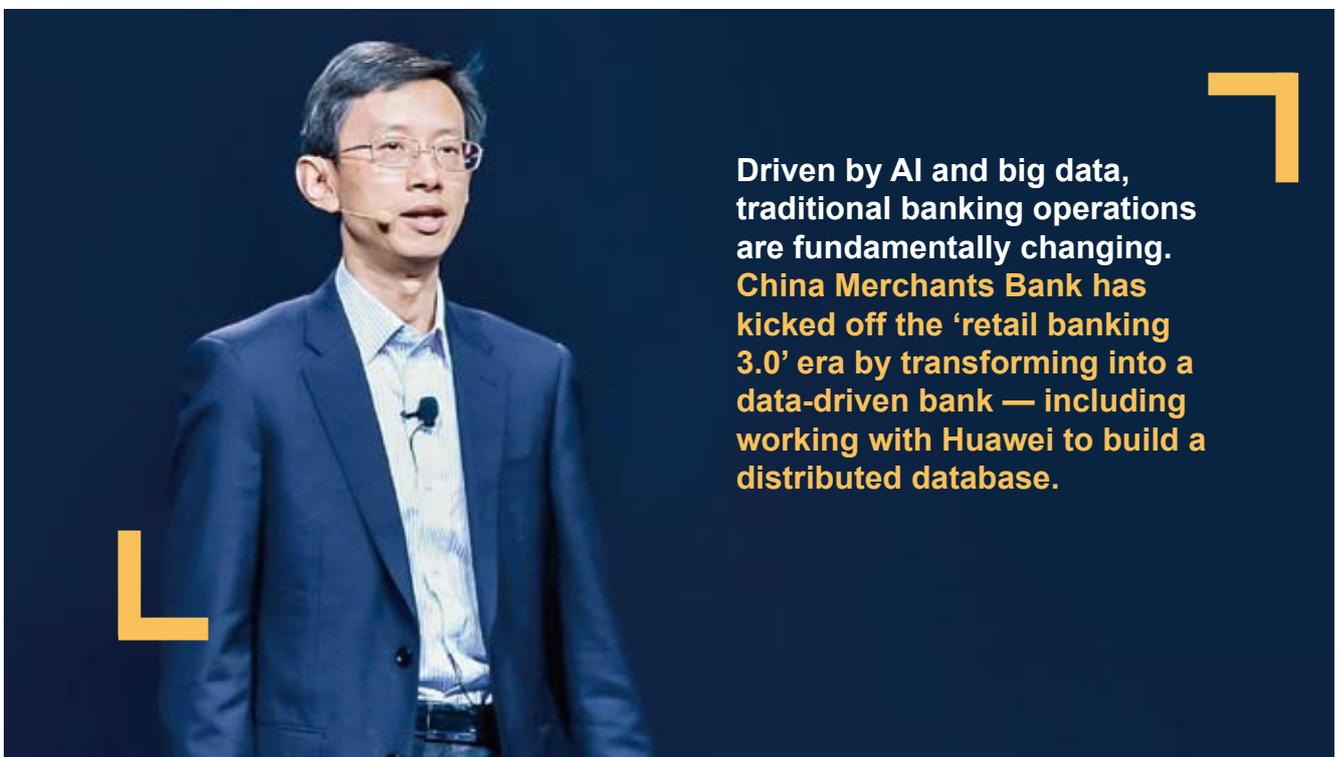
- **Natural Language Processing:** The massive volume of data available on the Internet includes highly valuable, but unstructured information. NLP allows users to realize the business value of this data. CMB analyzes the bid invitation and winning announcements of enterprises and governmental agencies on the network, and then parses the enterprises, projects, and amounts of the winning bids. This marks a starting point for discovering business opportunities in corporate banking services. Similarly, by analyzing court judgments

published on the network, CMB can identify plaintiffs and defendants, causes, and settlements for each case, and then use that information to warn individuals and enterprises when appropriate.

- **Knowledge Graph:** CMB is building enterprise graphs to depict complex relationships. Currently, the retail and enterprise relationship graphs map the data from 120 million individual nodes and 50 million enterprise customer nodes.

- **Intelligent Q&A:** This is a combination of NLP and knowledge graph technologies. CMB has implemented access to intelligent Q&A systems in over 600 scenarios.

- **Machine Learning:** In the financial industry, machine learning most frequently manifests as intelligent investment advising and marketing risk control. In 2016, CMB developed the first intelligent investment product in the Chinese finance industry — 'Machine Gene Investment,' which generates over USD 1.7 billion (CNY 12 billion) of business and serves nearly 200,000 customers. In addition to being the first of its kind, Machine Gene Investment is the largest intelligent investment product in the industry. Each retail transaction is checked by an anti-fraud platform. This platform, deployed with complex rules and models, is capable of processing transactions in 50 milliseconds, on average, to achieve real-time and intelligent fraud



Driven by AI and big data, traditional banking operations are fundamentally changing. China Merchants Bank has kicked off the 'retail banking 3.0' era by transforming into a data-driven bank — including working with Huawei to build a distributed database.

prevention. CMB has also explored the use of machine learning in financial forecasting and planning, for example, predicting the business volume of individual branches or the cash demand for each ATM location.

AI and big data technologies are revolutionizing every aspect of the banking system, operations, services, and management practices. The system is transforming from a traditional business model to a new, data-driven, and ‘lightweight’ banking model. CMB is dedicated to facilitating this transformation.

Working With Huawei to Build a Globally Leading Distributed Database

In keeping with this data-driven development trend, massive amounts of data need to be processed efficiently. Therefore, a scalable and high-performance database becomes the cornerstone of a bank’s IT infrastructure.

CMB has six requirements for an advanced database:

- High scalability for massive data processing

- High-performance, real-time processing for financial big data scenarios
- High availability to ensure the entire banking information system’s business continuity
- Cloud-based for on-demand allocation of separate computing and storage resources via a multi-tenant system based on isolated applications on a large cluster
- Easy Operations and Maintenance (O&M) of large databases
- Easy development that allows developers to avoid database and table partitioning at the application layer

Huawei is a Research and Development (R&D) leader in the database field and is able to build a variety of advanced database products. CMB, as a database-dependent customer, has requirements and scenarios for its businesses as well as extensive experience in database development and O&M. In November 2017, the two enterprises built a joint innovation lab to develop a world-leading distributed database product, GaussDB, with four goals:

- **High-performance enterprise-level kernel:** The single-node

CMB Experiments and Experience With AI

Image Recognition



- Facial recognition
- Account ID verification at video terminals
- Anniversary promotion: CMB logo scanned for prizes
- Facial-scanning wealth prediction
- OCR text scanning

- RFQ and competitive bid analysis
- Text classification
- Legal analysis
- Text mining

Natural Language Processing



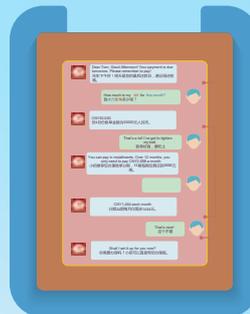
Knowledge Graphs



- Retail relationships
- Company relationships
- Private equity profiles

- Clear understanding: Customer names, times, and intentions
- Human-like customer service interactions
- Online completion: Efficient service fulfillment

Intelligent Q&A



Machine Learning



- Machine Gene Investment
- Proactive precision marketing
- Financial forecasting and planning
- Anti-fraud platform



Huawei is a research and development leader in the database field. CMB, as a database-dependent customer, has requirements and scenarios for its businesses. The two enterprises built a joint innovation lab to develop a world-leading distributed database product, GaussDB. >>

transaction processing capability must reach the million-per-minute level to enable distributed transaction ingestion, and meet the finance industry's data processing requirements.

- **Distributed high-scalability:** Linear scalability with a ratio greater than 0.8 is required. Clusters need to implement online scale-out without interrupting services.

- **Distributed high-availability:** In a single data center, if the Recovery Point Objective (RPO) is zero, the Recovery Time Objective (RTO) can be reduced to seconds. In addition, multiple data centers, copies, and the all-active function must be supported to achieve automatic fault diagnosis, isolation, and switchover.

- **Distributed cloudification:** CMB needs to implement computing and storage separation and support multiple tenants.

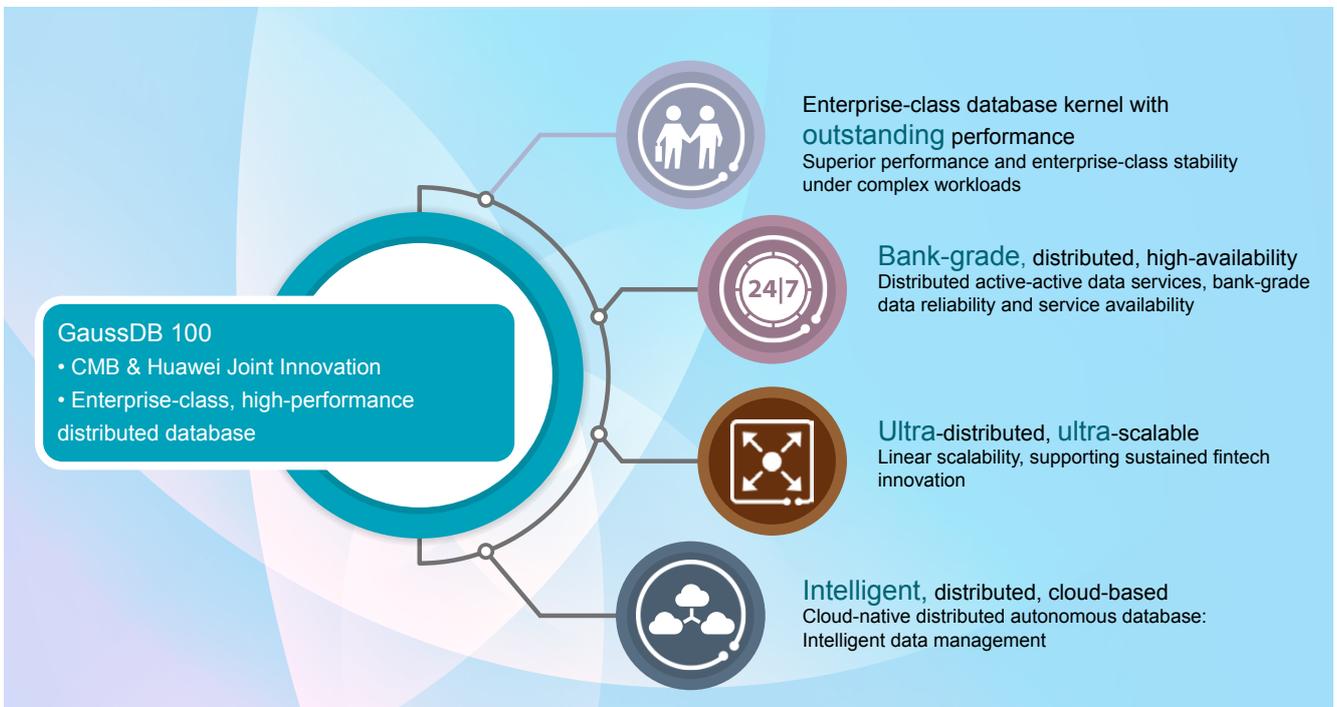
Currently, CMB has achieved the first and

third goals of this database project — a high-performance enterprise-level kernel and distributed high-availability. CMB has also deployed the GaussDB on two important business systems and have started to use it in production environments. In the future, CMB will focus on the following three aspects of the overall database architecture:

- Developing distributed databases and facilitating the transformation of the overall database architecture to better support business development at the database level.

- Simplifying mainstream database types and database technology stacks for easy development and O&M.

- Expanding the use of AI and machine learning technologies to build highly automated and intelligent database systems that can support low-cost, large-scale O&M. ▲



Shijinshi and Huawei Build Big Data Real-Time Credit Services

By Lan Jun, Deputy General Manager, Shijinshi Credit Information Services Co., Ltd.

In today's commercial society, a person's credit rating has a significant impact on all aspects of their life; whether applying for a credit card, purchasing insurance, or applying for a loan. Looking ahead, personal credit ratings will play an important role in more fields, including social networking, marriage prospects, and career development.

Credit Reporting Is Entering the Big Data Era

Credit reporting is an activity in which professional and independent third parties build risk profiles for individuals and organizations for use by banks and other external credit granting agencies.

The business logic behind credit reporting is based on the collection and analysis of data. Specific actions include processing massive amounts of multi-dimensional, heterogeneous data for the purpose of extracting value and knowledge for easy and interactive delivery to desired application scenarios.

With the expansive growth of the mobile Internet and big data marketplace, the service objectives for credit reporting have changed greatly. Service scenarios are transforming from offline, face-to-face interactions to online, real-time activities. At the same time, data sources are proliferating and data structures are becoming more complex to adequately cover users' online behavior, mobile tracking, transaction records, and consumption habits. The credit reporting market is on a fast track to enter the big data era. Over the next two years, the big data-powered credit reporting market will grow rapidly, with the potential to generate over USD 14.3 billion (CNY 100 billion) in value.

On March 3, 2016, China Mobile Communications Corporation and China Merchants Group established Shijinshi Credit Information Services Co., Ltd. (Shijinshi) as a joint venture in response to a government initiative promoting the use of big data in the credit reporting market. Shijinshi has entered China's credit reporting market with impressive credentials and stature: China Mobile is the country's largest mobile communications carrier with access to real-name materials for more than 800 million subscribers, and China Merchants Group is a longstanding leader in the financial

services industry that is deeply familiar with the application of credit reporting services.

In the past two years, Shijinshi has been dedicated to developing a real-time big data platform for commercial use. This platform uses the micro-service architecture that reduces the difficulty of deploying customer applications. Customers can concentrate on the application logic without worrying about how to handle the massive store of data that has been accessed, how data with different table structures is stored, or how to implement offline analytics conveniently. With more than two years of effort, Shijinshi has launched a mature platform for both internal use and for access by customers from other industries.

Take the application for the financial industry as an example. By using access to the abundant big data resources of telecommunications carriers, Shijinshi can quickly introduce that data — including user location, social circles, and account registration information — to financial services institutions for purposes such as providing risk management solutions like identity authentication, anti-fraud investigations, and comprehensive credit scoring for financial services applications through real-time analysis and calculation. In addition, this solution can also serve insurance, telecom, government, and other industries, and play an important role in insurance underwriting, transportation services, and government affairs.

Currently, Shijinshi's platform is successfully serving small- and medium-sized municipal and commercial banks. In the future, the use of big data in credit reporting will be extended for wider applications, such as insurance policies. Big data-capable credit reporting can also be widely used in other scenarios related to living, social, and vocational activities.



A new vitality is being infused into the credit reporting landscape due to the increased use of big data analytics.

Big Data Real-Time Service Platform With Multiple Advantages

Since October 2015, the founders of Shijinshi began to explore how to meet the requirements of high-frequency and real-time service scenarios in the financial industry. With the help of Huawei, Shijinshi planned and developed a real-time big data framework using the Hadoop platform as the underlying software. This platform has achieved good results after more than one year of commercial application, with the following specific advantages:

- **Second-Level Real-Time Transaction Services**

The Shijinshi platform has put the HBase columnar database directly into the production transaction system, and uses the HBase column structure to directly store transaction data. This approach has brought three benefits: First, an intermediate data conversion process is no longer needed before data analysis, and data losses are avoided because the columnar database was explicitly designed for data reliability. Second, HBase is massively scalable. Whether accessed from Tencent WeChat, QQ, or Sina Weibo, the table structure of HBase need not be modified or reformatted, which greatly reduces the burden of data processing. Third, unlike relational databases, HBase has no upper limit for scale.

The processing logic for computing complex batches is to decouple the source data into multiple real-time requests. The result is that time-consuming calculation and storage operations are

separated from the main request thread. Then separate operations are performed using a real-time-stream-processing framework that stores the results in the columnar database. A micro-service framework has also been adopted to support the fulfillment requirements for real-time services.

- **Minute-Level High-Speed Analytics**

In addition to real-time processing, credit-reporting services also require high-speed analytics. Columnar transaction data is stored in HBase, which is located at the underlying layer of the Shijinshi platform architecture. When analysis is required, data is directly synchronized from the primary data cluster to the backup cluster where the high-speed analysis is performed. There are three reasons why this platform architecture supports minute-level analysis. First, it enables fast data acquisition without incurring the time or cost of a long Extract, Transform, and Load (ETL) process. Second, preprocessing ensures that the machine is properly configured before the data is transferred. Third, a batch analysis is performed by the backup cluster rather than consuming the resources of the primary cluster — a technique that has been designed to complete the data modeling calculations within minutes.

- **High Availability for Real-Time Services**

The HA architecture is the most important and complex part of the credit-reporting platform, which took over nine months of designing solutions for a long list of issues. Real-time services

require continuity, and the primary and backup clusters are set up in the production system to guarantee resource availability in the event of a primary systems failure. A key design goal is the equal treatment of data consistency and service continuity. Specifically, data consistency is ensured in two ways: First, when the primary cluster is working properly, data can be wholly synchronized with the backup cluster; and second, that there is no data loss when the backup cluster takes over until the primary cluster recovers.

- **Columnar Information Chain With Full Time Series**

Kx Systems of Palo Alto, California introduced time-series-based, column-oriented databases to the financial services industry in 1998. A columnar database is different from a row-oriented design in the presentation of user credit histories and other credit information. This structure is called a ‘columnar information chain with full time series,’ which overcomes many natural defects of relational databases. For example, querying information about the repayment, occupation, and traffic violations of a user over the previous five years is a complicated task in a row-oriented relational database. However, with a columnar database, this is easy.

The columnar data structure allows external data to be quickly written in the database after simple classification. During data reading, the data structure supports convenient data recording according to the required classification, which reduces the data payload per interaction. In terms of scalability, when the classification of some information changes, a new classification table can be created or integrated with existing classification tables and migrated or

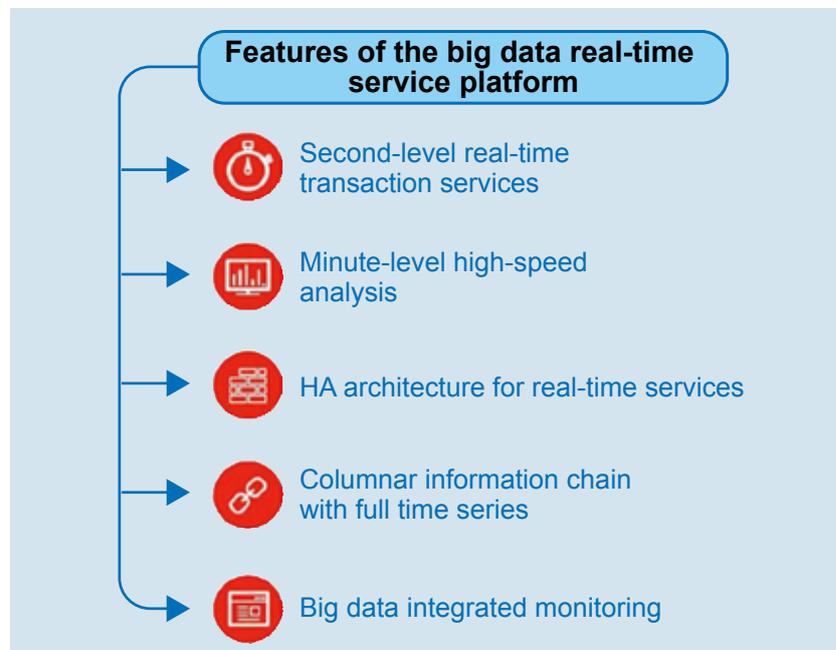


Shijinshi hopes to lower the barrier for entry into big data markets so more industries, organizations, and enterprises are able to reap the business value that these powerful systems are built to deliver. >>

consolidated into columns that match the original organization. By classifying and layering entity information, the platform is able to efficiently store a full series of information for each person or enterprise. With the continuous enrichment of the external original information layers and more in-depth analysis methods, the platform improves the information available for the final cognitive analysis layer through iteration for the purpose of supporting services of upper-layer applications and scenarios.

- **Big Data Integrated Monitoring**

Real-time monitoring with data visualization is an important indicator of technical maturity for clearly understanding the running status of an integrated platform. Key monitoring activities include resource scheduling and service tracking that are reported out at different time slices: real-time services are updated by the second, the latest changes for high-speed analytics are shown minute-by-minute, and offline services are refreshed hourly.



Using only nine nodes, this credit-reporting platform has processed up to 36 million requests per month and 1,000 concurrent Tabular Data Streams (TDSs), with the number of transactions increasing monthly. Many of China’s largest financial and Internet companies, including the Bank of Communications, China Minsheng Bank, China CITIC Bank, SPD Bank, China Merchants Bank, and Suning are now connected to the system. The complete system continues to meet all functional expectations in both stress test and production environments.

Huawei Digital Platform, Services, and Ecosystem

For the credit reporting industry, choosing a digital platform is always critical. For Shijinshi, Huawei offers the Hadoop big data digital platform technology — which includes powerful data storage capabilities and the ability to ingest large multi-dimensional data streams and output high-speed analytics. We expect this platform to continually improve Shijinshi’s ability to support real-time services with the potential to eventually replace relational databases. To support this effort, Huawei is committed to substantial and ongoing contributions to the open-source Apache Hadoop project. In particular, Huawei is invested in R&D and committed to making continuous component-level improvements and bug fixes in the areas

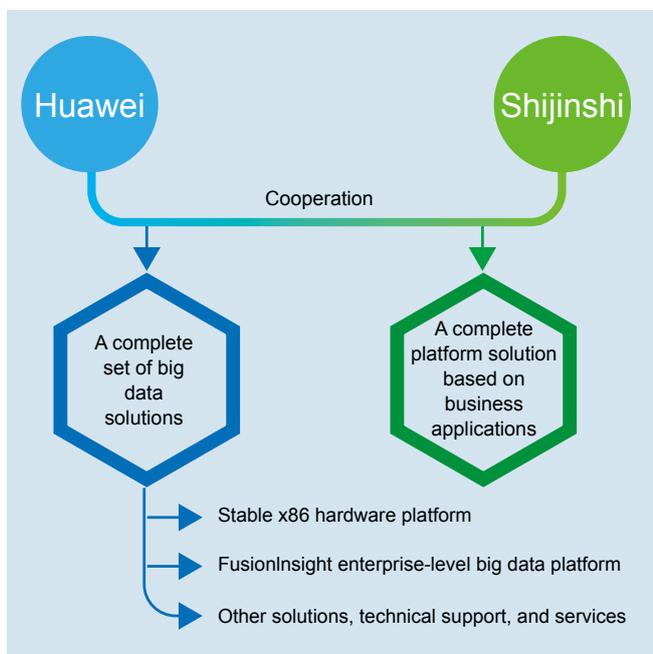
of security, reliability, ease of use, and performance optimization.

The cooperation agreement between Huawei and Shijinshi brings benefits to both parties. Huawei manufactures and delivers a complete set of big data solutions, from x86-based hardware platforms and the enterprise-level FusionInsight big data platforms to a full range of vertical market applications and technical support services. Shijinshi’s contributions have extended the Huawei ICT platform with the addition of its own specialized business applications.

Shijinshi designed a universal big data architecture with the goal of applying it to many industries. Based on HA, real-time performance, and high reliability, the result has been packaged into a platform-as-a-product that can be applied to fields other than the credit reporting industry that require real-time big data processing.

Huawei played an important role in the development of the Shijinshi platform and continues to provide generous levels of support when implementation issues are encountered. One such example occurred when Huawei sent a big data team to help with the Operations and Maintenance (O&M) of the big data cluster — where problems were detected, resolved, verified, and put into production in a timely manner.

Shijinshi hopes to lower the barrier for entry into big data markets so more industries, organizations, and enterprises are able to reap the business value that these powerful systems are built to deliver. Through the collaboration of Huawei and its channel partner network, Shijinshi is committed to developing a solid partner ecosystem throughout China. ▲



Customer Testimony

Huawei was selected because of its capabilities in digital platforms, services, and ecosystems. As a commercial system, the credit reporting service platform must have a digital platform vendor such as Huawei that is able to provide comprehensive capabilities that include reliable and trustworthy ICT solutions and services, as well as powerful channels and a comprehensive ecosystem.

— Shijinshi Credit Information Services Co., Ltd.



Fiber Powered by Grid

By Jack Zhu, Marketing Director, Energy Sector, Enterprise Business Group, Huawei Technologies Co., Ltd.

Broadband network infrastructure is increasingly important for the digital economy and the intelligent era. Broadband network coverage and quality directly affect national and regional economic and innovation capabilities in the fields of industrial digitalization and automation, the Internet, remote education, telemedicine, big data, and artificial intelligence.

All-optical network deployments continue to accelerate worldwide due to the benefits of improved bandwidth and performance. However, fiber deployments involve complex engineering operations like trenching, burying cable, house-to-house access, and indoor installation — which all pose great challenges in areas with high labor costs. Power companies enjoy rich engineering resources, possess extensive deployment experience, and boast strong technical teams and tools, making them well-prepared to handle these challenges. Rapid optical network developments have precipitated a vast expansion of opportunities for the development of digital services from electric power companies.

Advantages to Electric Power Companies

Electric power companies are responsible for constructing long-term national infrastructure. In addition to installing large numbers of towers, poles, and underground conduits; deployments now include the simultaneous deployment of optical fibers and electric cables.

In keeping with the need for governments to plan infrastructure in a holistic manner to ensure network reliability and stability, broadband networks have become a necessity of day-to-day life, and network security and reliability have gained significance equal to that of water, electricity, and gas.

In densely populated areas, fiber optic networks are being deployed by carriers in response to the business demand for short Return-on-Investment (ROI) cycles.

In contrast, the deployment of universal service networks in remote areas requires a national-level investment. Electric power companies are responsible for providing electricity in these areas, and integrating fiber optic networks and power infrastructures

are examples of the unique strengths available to electric power companies.

Many electric power companies around the world have achieved positive financial results by deploying fiber optic networks, either through joint ventures with telecommunications carriers or capitalized by themselves. Examples include Open Fiber (Italy), SIRO (Ireland), Dawiyat (Saudi Arabia), Copel (Brazil), and Altibox (Northern Europe). These investments have helped power companies expand their service scope and increase their revenue.

A good example for success is the broadband operation by Altibox, where the construction of the fiber optic network was based on the development of a market in video services. Today, Altibox has achieved a comparatively greater proportion of broadband and video users than are served by traditional telecom carriers. Further evidence for the successful investment by an electric power company in fiber optic networks is the fact that Altibox collects more revenue from broadband services than from the delivery of electricity.

State-owned power companies help governments implement long-term plans to build market credibility. For example, Dawiyat's all-optical network is being used to promote the Saudi government's *National Transformation Plan 2020 (NTP)* and *Vision 2030* initiatives. Dawiyat's new all-optical network has helped transform Saudi Arabia into a profitable link between the digital worlds of the East and West.

Broadband network construction promotes intelligent development for power systems. Electric power systems require the digital transformation of generation, transmission, transformation, distribution, dispatching, and intelligent meter communication processes.



Huawei's cloud-based platforms accelerate fiber deployments for electric power companies.

Cloud-Based Digital Platforms for Efficient Networks

Electric power companies leverage electric rights-of-way to deploy fiber optics quickly. For instance, SIRO deployed optical fibers in Ireland via underground power conduits and overhead poles to provide gigabit ultra-broadband access services and achieve Fiber-to-the-Building (FTTB) and Fiber-to-the-Home (FTTH) demarcation points.

SIRO has eliminated the need to rent equipment room space, improved deployment efficiency, and significantly shortened the deployment cycle by leveraging its electric power corridors by co-locating container-based equipment rooms to its existing power stations.

Beginning in 2015, SIRO's all-optical network has been deployed in 25 towns across Ireland covering more than 120,000 users by the end of 2017 — including providing wholesale-priced network access to multiple service providers such as Vodafone, Sky, Digiweb, and Carnsore Broadband.

All-optical networks are proven to create jobs, drive innovation, and promote rapid economic development for local communities.

Huawei provides electric power companies with cloud-based digital engineering platforms and tools that greatly improve the efficiency of fiber network planning, deployment, and service provisioning. Huawei has accumulated extensive delivery

experience in the market for digital platforms — including the SmartCapex planning platform, Integrated Service Delivery Platform (ISDP), and Automatic Provisioning System@ Intelligent Engine System (APS@IES) — which have all been widely adopted by telecommunications carriers.

• Resource Utilization and Planning

The Huawei SmartCapex analysis platform uses big data to help customers locate high-value subscriber activities to shorten ROI cycles.

The SmartCapex platform makes full use of existing resources to automatically plan and design networks that give full play to the advantages of existing digital resources.

For example, an Indonesian carrier using SmartCapex has analyzed more than 10 indicators — number of households, household consumption, competition, house density, low-bandwidth users, Internet access behavior, wireless grid traffic, average user download rate, mobile user traffic, and video traffic usage of mobile users — across the four dimensions of space, consumption, behavior, and competition.

The company has made plans to service more than 100 four- and five-star communities, and nearly 300 one-, two-, or three-star communities with live network resources. SmartCapex compared live network resources with user demand by geographic area. Plans were made to build up areas that were



Huawei's three major tools for optical networks

SmartCapex	ISDP	APS@IES
Network Planning Platform	Integrated Service Delivery Platform	Automatic Service Provisioning Platform
<ul style="list-style-type: none"> Locates high-value users and shortens ROI periods Uses live network resources to automatically plan and design the network 	<ul style="list-style-type: none"> Manages project, implementation, and information assets Uses multiple tools to ensure efficient, simple, orderly, and visible project delivery 	<ul style="list-style-type: none"> Features more than 500 data management rules Provides more than 200 resource models Covers more than 80 service scenarios Supports end-to-end service provisioning
<p>In Indonesia:</p> <ul style="list-style-type: none"> Installation rate: 10+ percent higher New users: 11+ million ROI period: 50 percent shorter 	<p>In Costa Rica:</p> <ul style="list-style-type: none"> Installation: 800 percent more efficient Paperless project management and delivery Higher project implementation efficiency and accuracy 	<p>Global:</p> <ul style="list-style-type: none"> Provisioned users: 200+ million Countries: 20+ Service provisioning time: 90 percent shorter

determined to be economically valuable but under serviced. The results are an increase in the installation rate for users from 32 percent to 45 percent. The number of new users reached 117,000 in 2017, and the ROI period was shortened from 6.8 to 3.8 years.

SmartCapex has been successfully deployed in multiple countries and regions including the Philippines, Saudi Arabia, South Africa, and India.

• **Engineering Delivery**

The ISDP manages projects, implementation, and information assets. The ISDP makes project delivery efficient, simple, orderly, and visible with tools that include smartphones, drones, and remote videos.

• **Standard:** ISDPs refine processes and deliverables for delivery planning and standardization.

• **Digital:** Actions produce records for the status of projects, networks, and sites that are visible in real time to achieve digital management.

• **Coordinated:** Delivery and resource plans are collaboratively updated, and schedules and simulations are performed automatically.

• **Automatic:** The ISDP simplifies processes and operations, including support for one-click implementation of multi-step operations like site surveys, quality inspections, and acceptance reports. The ISDP can perform remote site surveys with drones and video tools, and achieve automatic remote project acceptance with Optical Time-Domain Reflectometers (OTDRs).

• **Mobile:** The system can export progress reports in real time, allowing users to monitor issues and risks anytime and anywhere for efficient management.

For example, the ISDP implemented paperless project management and delivery in Costa Rica, which increased installation efficiency from one-half to four households per day.

Currently, the ISDP has been incorporated into the delivery of Huawei's global engineering projects.

• **Service Provisioning**

The APS@IES automatic service provisioning platform implements end-to-end service provisioning coverage for service orders, resource allocations, service activations, and charging feedback through cloud management. Each APS@IES has more than 500 data management rules and more than 200 resource models which can be adapted to 80 service scenarios.

The APS@IES can be deployed either locally or on public clouds, and supports multiple network types such as copper line, optical fiber, and wireless — and carriers can lease resources from the cloud platform without building their own Operational Support System (OSS) servers for maintenance, which reduces O&M investments.

The APS@IES has been deployed in more than 20 countries around the world and attracted more than 200 million users. The platform has improved efficiency by helping carriers reduce the time for



Electric power companies need to restructure and adapt to broadband network construction and operations. Concerning the creation of all-optical networks and broadband operations, electric power companies must provide different advantages than telecom carriers. >>

service provisioning from 2–3 weeks to 1–2 days. The APS@IES will provide more service management functions in the future.

Coordinated Development (Optical Fibers and Electricity)

Fiber optics are well insulated from electromagnetic interference, power surges, and lightning strikes. Because fiber optics do not generate electromagnetic radiation, they pose no risk to other electronic devices, which makes them ideal when combined with electrical power systems. For example, Optical Ground Wires (OPGWs) are widely applied in China for power transmission systems higher than 35 kV. All Dielectric Self Supporting (ADSS) optical fibers or Optical Fiber Composite Low-Voltage Cables (OPLCs) can also be used to deploy optical fibers and power cables simultaneously without increasing engineering overhead.

With continuous technical development, optical fibers can transmit information on a larger scale. For instance, a 200G WDM system with 96 color-phase carriers supports up to 19.2 TBs of single-fiber transmission capacity.

Power systems generally require a limited capacity for the automation signals needed for machine-to-machine communications, which leaves additional bandwidth available for lease by private enterprises. More and more markets are placing great expectations on fiber optic networks due to their high reliability, low latency, and lack of congestion when using hard pipes.

FTTH solutions facilitate the collection and transmission of user meter data while delivering broadband services. The future is a smart world where everything is interconnected — where all electronic devices in the household will be

networked, including refrigerators, televisions, air conditioners, and lighting fixtures.

Big data collected by smart homes will continuously provide power companies with frequency of use information for each appliance in the home to improve power planning and help people switch from responding passively to predicting proactively. Additionally, the combination of big data and Artificial Intelligence (AI) will enable intelligent energy production and allocation, making both more efficient and accurate.

Differentiated Advantages

The rapid development of fiber optic networks is allowing electric power companies to explore new services. Because of this, power companies should assume responsibility for constructing network infrastructure for providing universal broadband services in accordance with national broadband development plans.

Electric power companies need to restructure and adapt to broadband network construction and operations. Concerning the creation of all-optical networks and broadband operations, electric power companies must provide different advantages than telecom carriers.

The value of fiber optic networks should be fully explored and developed in a number of ways. For example, electric power companies may enhance the construction of infrastructure in order to achieve high security, reliability, and universal services. Or, power companies can lease idle wavelengths within the data transmission system, implement smart metering by leveraging home networks, and combine smart home big data and AI to achieve intelligent control for power generation and consumption planning. ▲

Guangdong Power Grid Builds First-Class, Inclusive Digital Platform

The growing demand for power, the spread of connected equipment, and the transition to renewable and distributed energy are reshaping the traditional Operations and Maintenance (O&M) methods of power companies. In keeping with China's national 'Internet + Energy' action plan, Guangdong Power Grid is building world-class smart grids to provide high-quality services for customers and to accelerate the development of 'Digital Guangdong.'

The fully connected digital campus for Guangdong Power Grid is a collaboration between Huawei and Guangdong Electric Power Development Co., Ltd. Under Huawei's 'One Center + One Platform' strategy, a single operations center supports the integration and management of up to 3,000 administrative offices. The center provides many services, including collaborative Office Automation (OA) applications, business operations, and production monitoring. Individuals at different layers can immediately handle incidents that occur anywhere, anytime. The digital platform uses Information and Communications Technology (ICT), such as cloud computing, big data, the Internet of Things (IoT), and Artificial Intelligence (AI), to provide smart services like smart warehousing, smart canteen, smart OA, and smart property management. This project is an industry-leading smart campus with cutting-edge technologies, advanced security and efficiency requirements, rapid response capabilities, and high employee satisfaction. These innovations transform Guangdong Power Grid into a smart grid operator, value chain integrator in the energy industry, and an ICT ecosystem service provider.

Integration of Field and Logistics Operations

Guangdong Power Grid manages 19 municipal power supply bureaus, numerous production sites, and more than 2,000 substations. With an operation so large, field employees are often dispatched to remote mountainous locations for O&M and repair work.

Scheduling time for employees to eat is difficult because of heavy workloads, long working hours, and long distances between operation sites and the canteens at the employees' offices. For employees to get hot meals without leaving their operating positions, Huawei and Guangdong Electric Power Development built a unified digital platform for the entire province. The platform integrates the canteen, finance, and work

order subsystems for each region, enabling convenient dining within the province. Power supply center canteens can now know the number of personnel who are repairing devices in nearby areas, and the intelligent operation center allocates catering resources accordingly. Employees working in remote areas are able to eat near their work site instead of returning to their home base for meals.

When dining at a remote campus, employees pay for their meals. Their expense records transfer across regions and departments, but sometimes complex data synchronization creates management 'blind spots.' Fortunately, the digital platform connects campuses and departments to build a foundation for unified data. When employees make payments using facial recognition software, the information is sent to the company's finance system. This benefits employees and finance personnel, plus it enables real-time reconciliation, eliminating the time lag of the previous system. The systems also analyze the number of repair personnel and predict dining trends using big data technology so that canteens can prepare meals on demand. This avoids food waste and ensures all employees will be fed, regardless of the fluctuating number of people eating in the canteen. Ultimately, the company increases the efficiency and strength of its maintenance and logistics operations to better serve its employees.

Unified Command and Dispatch for Any Emergency

A continuous power supply is integral to social stability and people's well-being. To ensure consistent power to every household, emergency repairs are frequently required. Guangdong Power Grid is responsible for providing reliable power even during natural disasters and adverse weather. Storms and landslides may damage power supply facilities, such as devices, lines, and networks at outdoor power stations, resulting in a limited power supply or even power outages.



Huawei's 'One Operations + One Platform' architecture helps transform Guangdong Power Grid into a smart grid operator, value chain integrator, and ICT ecosystem service provider.

Quickly assigning and mobilizing personnel to repair facilities is imperative when managing an emergency. The digital platform implements unified command and dispatch to visualize, control, and manage all personnel, vehicles, and objects. The flattened operations process significantly shortens decision-making and response time. In addition, the company has a comprehensive set of contingency plans specific to each layer and region on the power grid structure and management scope. This ensures quick handling and backtracking, when necessary.

The repair process involves a large number of vehicles and devices. In the past, personnel, vehicles, and outbound devices were manually counted and recorded, which was often inefficient, disorderly, and time-consuming. It slowed down the entire repair process. To solve this, the digital platform supports smart warehousing with powerful IoT technologies. It automatically extracts and identifies inbound, outbound, inventory, and transfer information; issues warnings; and intelligently manages available resources. Further, to ensure that escape paths are always open, emergency lanes and exit routes are monitored to automatically trigger an alarm when blocked.

When an incident occurs, the Location-Based Service (LBS) accurately locates assets and immediately displays the quantity and location of emergency vehicles and devices. Management personnel can detect the status of vehicles and devices so that repair teams can quickly perform their tasks and their operations can be tracked and optimized. The system also supports emergency resources and personnel after the incident.

Boundless Collaborative OA

Technology is reshaping the way people live and work as enterprises

adopt collaborative OA. Leveraging facial recognition and big data technologies, Guangdong Power Grid is developing a brand-new OA mode to create a more mobile workforce and cross-region operations. The first phase of the smart OA project is under way; smart attendance checks, visitor reception, and site access via facial recognition are the current focus. The project connects buildings, Human Resource (HR), administration, and other independent subsystems to support high-level collaboration between upstream and downstream enterprises in OA scenarios. In the future, collaborative OA will extend to more diverse scenarios, including visitor management, smart conferencing, smart office devices, and smart office resource management.

In offices, personnel and objects are connected with mobile terminals to enable ubiquitous services. This eliminates time and space constraints. Collaborative OA automates tedious tasks, such as manual registration, venue and meeting room reservation, and projector setup. This solution facilitates the smooth flow of data and business, allows employees to focus on high-value work, and encourages employee creativity. As a result, OA helps enterprises accumulate value.

A Digital Platform Makes a First-Class Enterprise

The goal of Guangdong Power Grid is to deploy a single unified network for the entire campus. This network will fully integrate personnel, object, and event data. The inclusive digital platform will connect everything and support big data analysis. Administrative transformation is the company's first step towards digitalization, with the goal of eventually providing people-centric logistics support. In the future, the digital platform will also integrate data flows in power scenarios to help accelerate technological innovation and support value-added services. ▲

Embracing this Unparalleled AI Era

By *Leo Zhu, Co-Founder, YITU Technology*

Modern deep-learning-based Artificial Intelligence (AI) is drastically different from the technology that preceded it over the past three decades. New AI is not merely theoretical or conceptual; its practicality and applicability have been proven by various applications, real-life scenarios, and large-scale data sets — and even though AI developments over the past five years have met expectations, many are worried new AI will disappoint (much as AI has in the past). However, I believe a new AI era has just begun.

Unparalleled AI Technology in an Era Without Authority

Recent years have seen numerous reports on AI, and there has been a lot of discussion about the growing popularity of AI and its impact on scholars, entrepreneurs, and investors. Generally the discussion focuses on three topics: significance, industry players, and

application scenarios.

As a scientific researcher and entrepreneur, I would like to share my thoughts from two perspectives. 1) Only industry leaders will be able to understand and push the leading edge of AI, and 2) enterprises can leverage technological foresight to gain momentum.





If we view the cooperation between YITU and Huawei as a pyramid, Huawei provides strong computing capabilities at the foundation on which YITU builds upon by giving full play to its world-leading artificial intelligence algorithms, allowing data to generate real value.

AI is not easy to evaluate. Judging between true and false, or differentiating between bubbles and real success is difficult. AI sciences are difficult for the general public to comprehend. Even the best AI labs in the industry find it difficult to evaluate each other's work, as interpretations are often based on biases and presuppositions when discussing objective scientific topics.

Remember, this is an era without a clear consensus or established subject matter experts. AI is developing in leaps and bounds everywhere, and many top AI labs in the U.S. continue to pursue a comprehensive understanding of the technology.

Even an AI director at a global search engine may fail to fully understand all the advancements of every department in the company. But a mere decade ago only three top professors in the field were needed to determine how AI is affecting the world. They could even accurately forecast what would happen in the next three years.

Today, however, is an era with no clear AI authority. Any new technology might deliver groundbreaking social changes and generate profound economic value.

AI Helps Us Understand the Limits of Human Intelligence

AI should be able to acquire the abilities of a three-year-old; that is, it should be able to attain the most important human characteristics. In many fields, AI has already surpassed

human performance. Machine image recognition surpassed that of ordinary people nearly four years ago, marking a significant tipping point for AI. Machines outperform humans in many of the most basic identification functions. For example, in terms of facial comparisons, machines outperform humans when identifying both familiar and unfamiliar faces. Machines can find your face among 1.3 billion others faster than your own mother. Machines might even know your significant other better than you — and in professional fields, machine identification may outperform experts with years of training.

Current AI helps us recognize the boundaries of our intellectual abilities.

Facial Recognition Applications Have Global Significance

Currently, China is pioneering the application of advanced AI in vertical scenarios, solving not only Chinese problems, but problems around the world. The significance of China's AI application scenarios will be felt around the world.

For instance, thanks to YITU's AI applications in law enforcement, the technologies police previously hoped to use have become available in the last two years. China alone now possesses technologies capable of the advanced functions that were once only possible in science-fiction movies.

Despite the rapid development and popularity of AI, industry insiders such as Baidu, Alibaba, and Tencent (BAT),

entrepreneurs, and investors still underestimate the great possibilities of cutting-edge AI technology.

AI Technology Dramatically Accelerates Business

Impossibilities of past decades are now a reality. Industry-level experimental data gives us insights into the far future. Today we say AI is popular because the overall results give us confidence.

Businesses continue to unlock AI application scenarios. As the technology is commercialized, the integration of AI and business operations will accelerate. The current level of intelligence on display in some applications is beyond our imagination, which has failed to keep up with the speed of AI advancements.

Meanwhile, technology's societal impact is an oft-discussed topic, which will only become more sensitive as AI surpasses human intelligence. The growth of artificial intelligence will change the division of labor tremendously, which is a problem confronting every modern nation. Many existential concepts need rethinking as AI changes the way we conceive ourselves. Our concepts and models of the social division of labor and economics will undergo dramatic changes over the next two decades.

Technological Foresight Is Paramount to AI Developments

AI by itself is not a product. Scientists have no special advantages in AI development; but instead, a technological understanding of business scenarios is the key. YITU's industrial deployment prioritizes the understanding of people, followed by the understanding of products and technology. We will continue learning, and aim to understand our customers (such as police officers or doctors) better than themselves.



Absent historical precedent or clear AI authority, we should work hand-in-hand with partners on this shared journey into the unknown. AI can even revolutionize all other technologies, including scientific disciplines like human-machine interaction, searching, robotics, microprocessor design, medicine, and pharmaceuticals.
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Technological foresight allows us to understand user data locations and its commercial value, so we can accurately predict further development. The gap between the top players in the industry may grow — especially between the very best of them — because development speed differs greatly from those who believe and those who don't.

Absent historical precedent or clear AI authority, we should work hand-in-hand with partners on this shared journey into the unknown. AI can even revolutionize all other technologies, including scientific disciplines like human-machine interaction, searching, robotics, microprocessor design, medicine, and pharmaceuticals. The past five years have seen explosive AI developments, which have only intensified our plans for the future. AI will soon enable multi-dimensional technologies to build on application scenarios, bringing us more dynamic experiences. From a multi-technological perspective, machine vision, hearing, semantic understanding, and motion control will quickly progress in the next few years. Terminal intelligence will combine with chips to penetrate the last barriers of user experience and interaction. The leap from the Internet of Things to the Internet of Intelligence will make intelligence ubiquitous.

Enterprises in a better position enjoy the advantage of time. Cumulative effects brought on by technological leadership and more pluralist AI technologies empower AI to be disruptive across industries. Such advantages not only determine the gap or positional relationship between the first and second players in an industry, but also enable leaders from AI-advanced industries to disrupt industries that currently undervalue AI.

We believe the potential of AI is unparalleled because we have seen it, and YITU is embracing this unprecedented era together with our partners. ▲

Four Initiatives: The Evolution of Huawei's Ecosystem Partnerships

By Frank Shen Surong, Director of Partner Strategy and Operations Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

“Huawei is committed to engaging the market to build the kernel for a digital world — for which the key to delivering digital transformation solutions is ‘ubiquitous connectivity + digital platform + pervasive intelligence.’”

The path for Huawei to become a primary supplier of the digital world is through the help and support of its partners. The key to any win-win ecosystem is to encourage and reward everyone to contribute their strongest ideas. Huawei will continue to evolve its ecosystem policies to attract more partners by offering better support to help them reach new heights.

In 2019, Huawei is focused on increasing the profitability of its ecosystem partners, simplifying international partner policies and processes, improving partner capabilities, and developing the ecosystem.

- **Profitability:** To improve partner profitability, Huawei has lowered the sales amount requirements for Base Rebate to reward partners with rebates for every penny they earn for us. Huawei's investment in partner incentives is estimated to double in 2019.

- **Simplicity:** Huawei continues to simplify policies and processes, including the capability requirements for channel partner certification, capability rebate assessment, and marketing support, such as the Market Development Fund (MDF) and Joint Market Fund (JMF). This simplification makes partner policies

easier to communicate, understand, remember, and implement — which ultimately facilitates greater cooperation.

- **Enablement:** Huawei will improve the capability requirements for core partners in the pre- and post-sale phases by increasing partner capability rebates and providing free training vouchers to encourage partners to invest in capability improvements. As a result, partners will be able to reap the benefits and more easily cope with the digital transformation challenges.

- **Ecosystem:** Huawei will provide solution partners with development and marketing fund support. Huawei will set up a Global Partner Incentive Fund (GPIF), strengthen service-delivery management, and expand the scope for MDFs to attract more partners to the ecosystem.

Huawei will also build a Partner Policy Center based on the e+ Partner platform to provide partners with transparent policy information and certification requirements, as well as incentives and programs, in a timely manner. Huawei's goal is to develop simple, fair, and transparent policies for ecosystem partners. ▲



Huawei's ecosystem policies continue to evolve. In 2019, the policy for overseas ecosystem partners will focus on increasing partner profitability, simplifying policies and processes, improving partner capabilities, and developing the partner ecosystem. >>



Fertile Soil for Cultivating the Digital Platform Ecosystem

By Wang Changcheng, Alliance & Solution Cooperation Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

To date, 211 enterprises on the *Fortune Global 500* list, including 48 of the *Fortune Global 100*, have chosen Huawei as their digital transformation partner. These enterprises appreciate Huawei's 'Platform + Ecosystem' strategy, which is driving industrial digital transformation.

Huawei's digital solutions are converged, intelligent, and inheritable. It integrates and connects new Information and Communications Technology (ICT), such as big data, the Internet of Things (IoT), Artificial Intelligence (AI), converged communications, video, and Geographical Information Systems (GISs) across devices, networks, and the cloud. The ecosystem embodies Huawei's concepts of openness, collaboration, and shared success. Dedicated to constructing a Costa Rican-style ecosystem, Huawei creates a favorable environment based on its digital solutions to boost partners' business growth and help them achieve digital transformation.

Solid Digital Foundation and 'Fertile Soil' for Ecosystem Cultivation

Huawei not only offers a solid digital solution, but also provides

soft, fertile soil for the ecosystem. This figurative 'soil' is similar to the literal soil of the Earth, which constitutes the loose surface of the lithosphere and supports the survival of terrestrial plants and animals.

Based on the cloud, Huawei's digital solutions enable business collaboration and agile innovation for its customers by building a foundation for the digital world that integrates ICT platforms with various types of data. Digital transformation cannot be completed with any single technology. Clouds depend on the large amount of data generated by devices; and clouds and devices are best connected through ubiquitous networks. Therefore, pervasive intelligence can only be achieved by coordinating the IoT, big data, video, converged communications, security, GIS, AI, and other new ICT. That's where Huawei's strongest capabilities, which are as solid as the Earth's



Leveraging a solid digital solution and open cooperation mode, Huawei guides and supports partners to cultivate the fertile soil for constructing a digital ecosystem that empowers partners to develop joint solutions on the platform. Together, we are building a robust ecosystem for a mutually beneficial coexistence.

lithosphere, come into play.

Huawei's digital solutions are open and collaborative, featuring co-construction and sharing for mutual benefits. Huawei has invested heavily in a cooperative ecosystem to develop the soft, 'fertile soil' needed to construct an open digital ecosystem. In doing so, Huawei aims to expand the industry market space and to form a community of common interests for a mutually beneficial coexistence.

Policy Support and Regulation

Currently, Huawei has a digital platform and fertile soil to grow the ecosystem. The next step is to improve the 'soil' and regulate partner operations. Huawei conducts technical training, experience sharing, and joint solution launch activities with partners. More importantly, it invests intensively in cultivating the ecosystem to develop, promote, and sell joint solutions with partners, which will expand the market space and bring shared success.

In 2019, the development fund, marketing fund, and partner management modules are appearing in the Huawei Enterprise business partner policies. This supports and regulates solution partners in scenarios such as joint solution development, joint marketing, implementation, and partner selection for projects.

- **Development fund**

Incentives are granted to solution partners who have invested heavily in key business fields to support joint solution development. This fund encourages solution partners to continue long-term cooperation when they have worked with Huawei for many years, but have yet to see a return on investment.

- **Marketing fund**

This fund is offered to solution partners to increase investment in the joint marketing of developed solutions. It will help partners promote

solutions to customers, extend solution influence, acquire project leads, and facilitate solution deployment.

- **Partner management**

A hierarchical partner resource pool is built to provide reliable solutions for customers and to ensure solution delivery. This approach will regulate solution partner selection and project changes; create a fair, competitive environment; and protect partner rights and interests. In this way, Huawei and partners can deliver high-quality, reliable, and transparent solutions to customers.

Development and marketing funds help fertilize the soil. By regulating partner management, we can protect partners' initial investments, prevent soil degradation, support partners, and serve customers — thus building a robust ecosystem.

A Solid Platform for Partners to Thrive

After Huawei released its 'Platform + Ecosystem' strategy, iSoftStone partnered with Huawei in multiple business fields. The two parties complement each other, developing solutions with differentiated competitiveness to rapidly respond to various digital needs and offer scenario-specific solutions and services. Huawei provides a data foundation, connection tools, and an ecosystem via technological innovation so that iSoftStone is able to focus on customer needs and core services, significantly improving its efficiency.

In November 2018, software giant iSoftStone and Huawei unveiled an Intelligent Operation Center (IOC) Solution for the Smart Campus, based on Huawei's digital solutions. This lightweight, scalable solution covers a variety of scenarios and integrates the Application Building Cloud (ABC) for page orchestration, service orchestration, twin assets, and core assets; plus



Huawei Southern Pacific OpenLab leverages solution partner policies to actively expand its cooperative ecosystem and to conduct joint development, promotion, and market expansion with partners. In particular, it has made breakthroughs in video cloud solution cooperation. >>

the Relationship, Open, Multi-Ecosystem, and Any-Connect (ROMA) for APIs, FDI, and MQS capabilities of Huawei's enablement platform. It offers multiple Smart Campus applications, such as comprehensive situation displays, smart security management, personnel management, vehicle management, and asset management.

In the joint solution, ROMA connects to southbound devices and systems. As a result, development at the application layer does not need to worry about southbound protocol types or data types. The solution unifies access standards, simplifies application integration, and enables cloud-pipe-device synergy. It provides a one-stop digital technology platform with full connection, video cloud, location, AI, and integrated communications services, which facilitates application building. The display layer and application layer use the ABC development mode and provide Graphical User Interfaces (GUIs) and service orchestration capabilities.

With Huawei's digital solutions, application integration and service orchestration become more convenient and efficient. A large number of components and specialized assets are embedded into the platform. Component-based development facilitates asset accumulation and greatly shortens the delivery time, increasing project development efficiency by 40 percent. The joint solution has been successfully deployed in multiple projects, such as the Linyi Economic Development Zone, the Myanmar Shwedagon Pagoda, and a Smart Campus in Shandong Province. iSoftStone continues to flourish and thrive using the Huawei digital ecosystem platform.

A Large Ecosystem in Which All Players Can Prosper

The Southern Pacific Region has a large

ecosystem, containing software companies from China, India, and Western countries. Huawei Southern Pacific OpenLab leverages solution partner policies to actively expand its cooperative ecosystem and to conduct joint development, promotion, and market expansion with partners. In particular, it has made breakthroughs in video cloud solution cooperation.

Chinese partners such as Intellifusion and Seemmo offer facial and feature recognition capabilities for humans, vehicles, and other objects; Vaxtor provides license plate recognition and vehicle-attribute recognition capabilities; and Huawei's digital solutions support service and data aggregation to facilitate partner application development, interconnection, and service orchestration. This ultimately helps partners develop their service capabilities on the platform. Together, they produce award-winning solutions, like the Huawei Video Cloud Solution, which has won recognition from customers in Singapore's public security projects.

The cooperation of partners in public security projects grows from the fertile soil of the Huawei ecosystem. Southern Pacific OpenLab will further develop and test partner capabilities through projects, and it will build a regional resource pool for the video cloud, facilitating solution partner selection for similar projects.

Leveraging a solid digital solution and open cooperation mode, Huawei guides and supports partners, cultivates the fertile soil for ecosystem construction, and empowers partners to develop joint solutions on the platform. Ecosystem participants absorb nutrients from the soil and also make the soil more fertile. Together, we will build a robust ecosystem for a mutually beneficial coexistence. ▲



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