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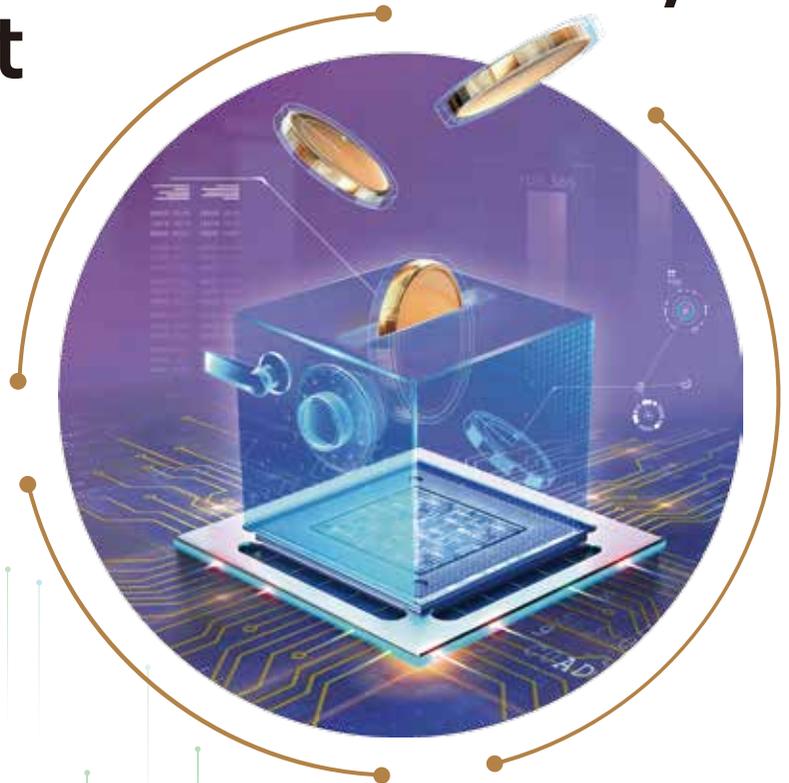
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## Thriving in a Mobile Future: Working Together Toward Smart Finance

Guo Ping, Rotating Chairman of Huawei

## Empowering the Financial Industry in the Intelligent Mobile Era

Cao Chong, President of Huawei Global Financial Services Business





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# Inside



## Comment

- P4 **Thriving in a Mobile Future: Working Together Toward Smart Finance**  
Huawei will help the global finance sector address post-pandemic challenges, accelerate mobile and intelligent transformation, and develop core digital innovation capabilities and competitiveness. >>

## Features

- P8 **How Mobile Will Lead Banks Out of COVID-19**  
The path to global financial inclusion was never going to be through a branch. The future of banking is already here, and it's in your pocket. >>
- P12 **Digitization Safeguards Financial Enterprises in Turbulent Times**
- P16 **Promoting Inclusive Financial Services to Build a Fully Connected, Digital World**

## Special Reports

- P22 **Empowering the Financial Industry in the Intelligent Mobile Era**  
In the intelligent mobile era, Huawei — with its vision, insights, solutions, ecosystems, and experts — is uniquely positioned to create new value. The global outbreak of COVID-19 has disrupted the lives and businesses of countless people, and the transformation to digital business models poses huge challenges to every industry. >>
- P29 **How Should Banks Respond to the Rapid Growth of Mobile Payments?**

## Focus

- P32 **AI, 5G, and Cloud: Building Smart Branches for Banks**  
Huawei's "AI + 5G + cloud" platform will make more high-quality bank branch applications a reality, providing strong support for the construction of smart bank branches. >>
- P37 **Banks Seek New Digital Core to Enable Transformation**  
A new digital core is a platform or system that uses new technologies to support digital banking services as banks undergo digital transformation. >>

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- P42 Huawei’s Converged Data Lake Solution Accelerates Service Innovation in Banking
- P46 Intelligent Financial Network Paves the Way for the Bank 4.0 Era
- P50 Building an Intelligent Data Foundation for the Financial Industry

### Success Story

- P56 New Converged Data Platform Helps ICBC Execute ECOS Strategy  
Huawei and ICBC have cooperated over the past five years to build and operate a massive cloud data lake. >>
- P60 Bank of China’s Cloud Platform Boosts Development of Smart Financial Services  
Bank of China has completed the largest-scale deployment of a distributed cloud platform in the finance industry. >>
- P64 Chinese Banking Giant CCB Builds the First ‘5G+ Intelligent Bank’ Offering New Marketing Services
- P68 CMB: Promoting Network Transformation, Creating the Future of Financial AI
- P74 China Everbright Bank: Building an “Intent-Driven” Next Generation WAN
- P80 China CITIC Bank Goes Digital with Huawei All-Flash Storage
- P82 Piraeus Bank: All-Flash Storage Meets Ever-Growing Demand for New IT Services
- P86 Ghana Commercial Bank Implements a Mobile Money Strategy



### Ecosystem

- P90 Chinasoft International and Huawei Build Financial Digital Infrastructure Together
- P94 Sunline Technology and Huawei: Transforming Global FinTech with Chinese Wisdom
- P98 Huawei and Jet Infosystems Take on Tough IT Industry Challenges



Facebook



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# Thriving in a Mobile Future: Working Together Toward Smart Finance

By Guo Ping, Rotating Chairman, Huawei



2020 is destined to be an unusual year. The COVID-19 pandemic has tremendously impacted life and work worldwide, casting a shadow over the global economy. The future has become increasingly uncertain, and people are starting to think about how to cope when the “black swan” event becomes the new norm.

## Challenges and Opportunities Facing Financial Institutions During COVID-19

With the rapid spread of COVID-19 worldwide, reopening economies while ensuring safety, and preventing a second — or even third — wave of the pandemic have become major challenges. These challenges, plus an economic downturn, have left the world facing increasing uncertainty.

The world’s major economies have stagnated, or even experienced negative growth, and national governments and central banks are facing unprecedented challenges. It’s difficult to strike a balance between reopening economies in the short term and avoiding financial risks, which has caused uncertainty for fiscal and monetary policies.

Meanwhile, consumers’ reluctance to spend and disruptions to supply chains have had a continuous and unprecedented impact on enterprises in regards to demands, operations, and financing. Survival has become

increasingly difficult for many enterprises. Financial institutions, which serve hundreds of sectors, are no exception, and face huge challenges in both the short and long term.

During the pandemic, 25 percent of all brick-and-mortar financial outlets have been closed, while the remaining outlets have shortened their opening hours and reduced staff numbers. Many bank staff have been unable to work as usual, disrupting normal operations of data centers and call centers. The pandemic has seriously impacted client acquisition and marketing channels, causing a sharp drop in both client numbers and product sales at financial institutions.

In the long term, financial institutions will face great pressure from low-quality assets, which will negatively impact their credit ratings, core capital, and equity financing. Compounding these problems, many financial institutions will face restructuring or go bankrupt. Measures such as downsizing outlets, optimizing positions, and reducing costs have

*Huawei has a unique advantage of providing financial institutions with solutions that range from connectivity to intelligent computing and from the core to the edge. These solutions will help the global finance sector address post-pandemic challenges, accelerate mobile and intelligent transformation, and develop core digital innovation capabilities and competitiveness.*

become the new norm for financial institutions.

As tech giants compete across borders, financial institutions face challenges regarding client acquisition and profitability, which endangers their long-term business performance. Digital and agile operations capabilities will be vital to bridging the gaps between financial institutions and enabling leading institutions to overtake their competitors. Reshuffling and restructuring will become major trends for financial institutions.

### **Digital Transformation Has Become a New Direction for Financial Institutions**

It is worth noting the increasingly important role that technologies, especially digital and mobile technologies, have been playing during the pandemic. The inability of brick-and-mortar stores to serve customers has led to explosive growth in online shopping, in areas such as groceries and medicine, incubating many new businesses. Numerous students have been learning online from home, which has directly driven the development of live lessons and distance education.

Many sectors and enterprises that are closely related to national economies have been able to use innovative technologies, like mobile offices and remote videos, to rapidly resume work. Thanks to stronger remote collaboration capabilities and higher work efficiency, enterprises that are taking the lead in digital transformation are more capable of resisting risks caused by the pandemic.

The same is true with the finance sector. Banks' response to the pandemic clearly shows that digital and mobile capabilities are critical to addressing business challenges. Enhancing such capabilities will allow banks to weather the current crisis, leaving them in a better position to address future challenges.

The pandemic presents the finance sector with a great opportunity to reshape its infrastructure. This will allow the sector to achieve digital and mobile operations for its internal processes and workflows, better manage and process data, and provide more personalized services and products that better suit clients' needs.

To achieve those goals, executives of financial institutions must re-consider how to use mobile and digital approaches to ensure business continuity. I would offer the following recommendations:

**Begin with mobile office platforms to maximize the value of bank resources:** For example, departments inside banks can collaborate anytime, and bank staff can assign and track tasks anywhere. Account managers can communicate with their clients and conduct marketing from home.

**Enhance mobile apps platforms and use mobile programs (such as outstanding apps) to establish unified interfaces for 24/7 client services.** Banks should reshape their services throughout the client journey, allowing clients to enjoy one-stop services, including consultation, investment, insurance, loans, payments, food deliveries, and ride hailing. Banks can also use flexibly structured technical capabilities to transcend service boundaries, connect to numerous sectors, and provide better services.

**Upgrade big data and AI capabilities to gain access to more data:** This will allow banks to more proactively and effectively conduct stress tests and risk controls, ease the pressure posed by low-quality assets, and reconfigure assets.

In addition, as all sectors — including governments and regulators — are rapidly going digital, digital transformation has become a must for financial institutions. Executives of financial institutions should proactively introduce leading technologies

and implement digital transformation step by step.

Develop a “mobile first” strategy to keep pace with the mobile trends; establish organizations in regards to technology, business, operations, and risk controls, and encourage changes in cultural systems.

**Introduce cloud computing technology to build an agile and scalable digital pedestal, and gradually move business capabilities to the cloud;** gradually change the operating model from being offline to online, and ensure asset-light operations.

**Iteratively upgrade mobile client platforms and office platforms, and reshape services throughout the client journey;** establish an open, flexible, and superb system architecture that allows bank outlets to develop functions based on business needs and open up services to third-party platforms. This will enable banks to more frequently connect to and closely collaborate with Internet platforms.

**Apply technologies like big data and Artificial Intelligence (AI) to enable ubiquitous banking services and continuously improve client experience.**

Finally, the sector must keep pace with the development of new technologies and explore future possibilities in advance. This is important because competition in the finance sector will no longer be limited to financial institutions. New technologies, especially 5G, will revolutionize connections at bank outlets. More importantly, these technologies will inspire comprehensive client experiences and ubiquitous business innovations. Banks will evolve from their traditional roles as banks for people to banks that also connect “things.”

In the future, digital technologies like 5G, Wi-Fi 6, the Internet of Things, and cloud will provide numerous mobile devices

with fast Internet access, leading to exponential growth in connections and information exchanges. All kinds of financial services will be aggregated and delivered to mobile devices without users even knowing. Users will be able to access financial services from their smartphones anytime, anywhere. Through Virtual Reality (VR), users will even be able to communicate with bank professionals “face-to-face,” while smart assistants will provide them with detailed investment plans and fund arrangements. The possibilities are endless. Technological developments will cause disruptive changes to



financial services, and all this is just the beginning.

### **Huawei Works with Ecosystem Partners to Help Financial Institutions Go Digital**

Huawei advocates an overall strategy of combining connectivity and computing ICT infrastructure. The company aims to provide the world with the best connectivity through powerful, simple, and intelligent networks. Huawei also aims to provide the world with the most effective computing power through its “general computing power + AI computing power” to enable pervasive intelligence.

Connectivity and computing will collaborate and correlate through AI. “Connectivity” transmits data to “computing,” while “computing” provides support for “connectivity.” Together, they create intelligent ICT infrastructure for digital economies. By focusing on digital ICT infrastructure that consists of connectivity, computing, and AI, Huawei is committed to building an open ecosystem.

Huawei also aims to build a digital platform that will help its partners and customers in the global finance sector go digital. Based on clouds, Huawei’s digital platform will integrate new ICT technologies and data of the finance sector. Upward, this platform supports the rapid development and flexible deployment of apps, and enables agile business innovations for financial institutions. Downward, the platform improves “cloud-network-device” synergy through ubiquitous connectivity, further integrating the physical world with the digital world.

As we are about to enter the age of

intelligence, we position our enterprise business as “Huawei Inside.” This represents our aspiration to become the core of the digital world and build an open, digital pedestal through a combination of ubiquitous connectivity, a digital platform and pervasive intelligence. Huawei is also committed to developing a partner ecosystem and providing its customers in the global finance sector with end-to-end industry solutions.

Huawei has a unique advantage of providing financial institutions with solutions that range from connectivity to intelligent computing and from the core to the edge. These solutions will help the global finance sector address post-pandemic challenges, accelerate mobile and intelligent transformation, and develop core digital innovation capabilities and competitiveness.

Over the past 10-plus years, Huawei has worked with more than 5,400 solution and service partners worldwide, serving over 1,600 financial institutions in more than 60 countries and regions. Throughout this process, Huawei has accumulated vast experience in doing business with the finance sector and has built a sound ecosystem.

In the Chinese market in particular, we have helped leading banks complete digital transformation and proactively respond to the disruption and competition from Internet financial service providers. We have gained vast experience in facilitating the robust development of banks during the age of mobile banking. We are more than willing to share our successful experience and ecosystem with the global finance sector, to help rapidly move the sector toward mobile and smart finance.▲



*Over the past 10-plus years, Huawei has worked with more than 5,400 solution and service partners worldwide, serving over 1,600 financial institutions in more than 60 countries and regions. >>*



# How Mobile Will Lead Banks Out of COVID-19

By **Brett King**, CEO and Co-Founder of Moven

**W**hen Cosimo de' Medici founded the Medici Bank in 1397, little did he know that it would shape the way commerce was conducted globally for centuries to come. For the next 550 years, banking hardly changed at all. But when the Stanford Research Institute, under contract from Bank of America, built the first mainframe computer designed for bank bookkeeping and check processing, it was the start of a decades-long transformation of banking and financial services focused on both core technology and customer practices.

In my recent book, *Bank 4.0*, I showed how these changes are accelerating and how both digitization of industries at large, along with technology-first providers continuously attacking friction, are leading to a transformation of the entire banking sector globally. It started with the introduction of self-service and Internet banking capabilities in the 1980s and 90s, and is continuing through the use of Artificial Intelligence (AI), Augmented Reality (AR), and voice technologies that we're seeing the early stages of today.

## Digital Technologies Bring the Benefits of Financial Mobilization

In 2014, I predicted that by 2025 branches in Western economies would be around 70 percent of their pre-digital

peak. That estimate seemed aggressive back in 2014, but today with the impact of COVID-19, it looks increasingly likely. More significantly, by 2025, most people with a basic value store of digital money (like a mobile wallet or super app) will have never seen the inside of a bank branch. That's because the next 2 billion people who bank won't ever have visited one.

In 2005, if you lived in Kenya, there was a 70 percent chance you didn't have a bank account, nor could you store money safely, and it's likely your savings were non-existent. Today, if you're an adult living in Kenya, there's a 98 percent likelihood that you have used a mobile money account (stored on your phone SIM card), and that you can transfer money instantly to any other adult in Kenya. Data shows that Kenyans now trust their phone more than they trust cash in

***The smartphone has halved financial exclusion in just 10 years. It took banking 500 years to reach the same level of financial inclusion that the smartphone achieved in a decade. So the path to global financial inclusion was never going to be through a branch. The future of banking is already here, and it's in your pocket.***

terms of safety and utility, with people sewing SIM cards into their clothes or hiding them in their shoes so they can more safely carry their money with them. This is all possible because of a mobile money service called M-PESA, created by the telecommunications operator Safaricom. Today, at least 40 percent of Kenya's GDP runs across the rails of M-PESA.

*"We're currently sitting at about 22 million customers out of a total mobile customer base of about 26 million. Now, if you take the population of Kenya as being 45 million, half of whom are adults, you can see we're capturing pretty much every adult in the country. We are transmitting the equivalent of 40 percent of the country's GDP through the system, and at peak we're doing about 600 transactions per second, which is faster and more voluminous than any other banking system."*

— Bob Collymore, CEO of Safaricom/M-PESA, in 2016

When it comes to financial inclusion, Kenya has done more to improve the lot of its populace in the last 10 years than the US has done in the last 50. Indeed, Kenya today has a higher rate of financial inclusion than the United States — a mind-blowing statistic. In the US, the Federal Reserve reports that approximately 20 percent of US households are unbanked or underbanked, while 97 percent of the Kenyan adult population has access to a mobile money service that acts as a basic bank account or value store. Despite a decrease of 12 percent in branch numbers since 2008, the US remains one of the highest branch density economies in the world. How can it be that the country with the second-highest per capita density of bank branches in the world still has one-fifth of its households underbanked? The answer is identity documentation and lack of mobile adoption.

One of the primary causes of financial exclusion today

isn't simply access to banking, but access to the identity documents that are required to open a bank account. Since 9/11, documentary requirements to open a bank account in the US have become stricter, in line with the Patriot Act and the Customer Identification Program (CIP) that's enshrined in US banking law and regulations. However, more than half of the US population doesn't have a passport (only 42 percent had one as of 2018), and only 76 percent of the population has a driver's license. Even if they could get to a bank branch, 20 to 25 percent of the US adult population wouldn't qualify to get a bank account.

In India, up until 2014, less than 30 percent of the population had a bank account. The Reserve Bank of India had tried increasing branch access; in fact, they put in place regulations that meant growing banks in India who wanted to deploy new branches had to put one of every four new branches in rural areas not yet served by a bank.

As of 2018, more than 1.2 billion Indian nationals had been enrolled in the Aadhaar identity card program. That's a whopping 88 percent of the Indian population. The effect of identity reform in India is that the number of those included in the financial system has skyrocketed. The segment of the population most excluded in the old banking system — lower income households and women — has seen 100 percent year-on-year growth every year since the Aadhaar card initiative was launched in 2009. As of 2015, more than 358 million Indian women (61 percent) had bank accounts, up from 281 million (48 percent) in 2014. This is the biggest single jump for 'banked' women among eight South Asian and African countries. Meanwhile, Paytm, the largest mobile money service or mobile wallet app in India, has exploded in popularity. Back



*The benefits of financial mobilization are numerous. In Kenya, where approximately 49 percent of GDP flows through M-PESA, Kenyans are reported to be saving up to 26 percent more today than when they only used cash. >>*

in 2016, Paytm aimed to have 250 million users by 2020, but they are already at more than double that number. Branch activity has continued to decline in India.

The benefits of financial mobilization are numerous. In Kenya, where approximately 49 percent of GDP flows through M-PESA, Kenyans are reported to be saving up to 26 percent more today than when they only used cash. Crime is down, savings are up, but the most interesting effects are in response to poverty, credit access, and employment. Access to mobile money has lifted two percent of Kenyan households (194,000 families) out of extreme poverty, brought 185,000 women out of subsistence farming and into business, and increased access to basic credit facilities for starting a business or dealing with emergencies.

In China, the use of facial recognition technology along with mobile payments capability has transformed the economy in just six short years. Despite the difficulties of the COVID-19 pandemic, China's citizens have remained productive financially because of a very strong mobile financial services capability built on top of Ant Financial's Alipay and Tencent's WeChat Pay. In 2019 mobile payments in China exceeded US\$ 31 trillion, almost 30 percent higher than the estimated US\$23 trillion in plastic card payments globally. Yes, that's right: China's mobile payments transaction exceed the entire world's transactions on credit and debit cards.

One of the most successful savings products in history, Ant Financial's Yu'e Bao, and the most successful challenger bank in the world, WeBank, have both emerged on top of this mobile ecosystem. With more than 34 percent

market share of the world's smartphone market, and the leading 5G technology on the planet, the mobile ecosystem of China rivals that of any other nation today.

### **The Future of Banking Is in Your Pocket**

If you are a bank emerging from the Coronavirus crisis, then, what should you do?

One thing that has become glaringly clear during COVID-19 is that, as a result of reliance on physical branches, most major banks neglected building real engagement capabilities with customers in the digital sphere. We only really focused on the acquisition of customers (revenue-side) and self-service capabilities that reduced costs to the bank; we didn't see value in engaging customers digitally when they could do that in a branch, and that was a strong use case for ongoing branch relevance. But challenger banks have come through COVID-19 with much stronger perceived engagement and service metrics than traditional players. That's because their tone of communications, their ability to respond to critical service issues, and their capacity to adapt in terms of offerings have all stood out above traditional players.

Secondly, most challengers and startups in general have found working from home a trivial matter, and they've also appeared to weather this storm much better than traditional players. For example, Twitter announced in May that it was making working from home optional moving forward, and many companies will find their large retail office spaces increasingly questioned in an arena where telecommuting has become strongly viable, and even critical. In fact,

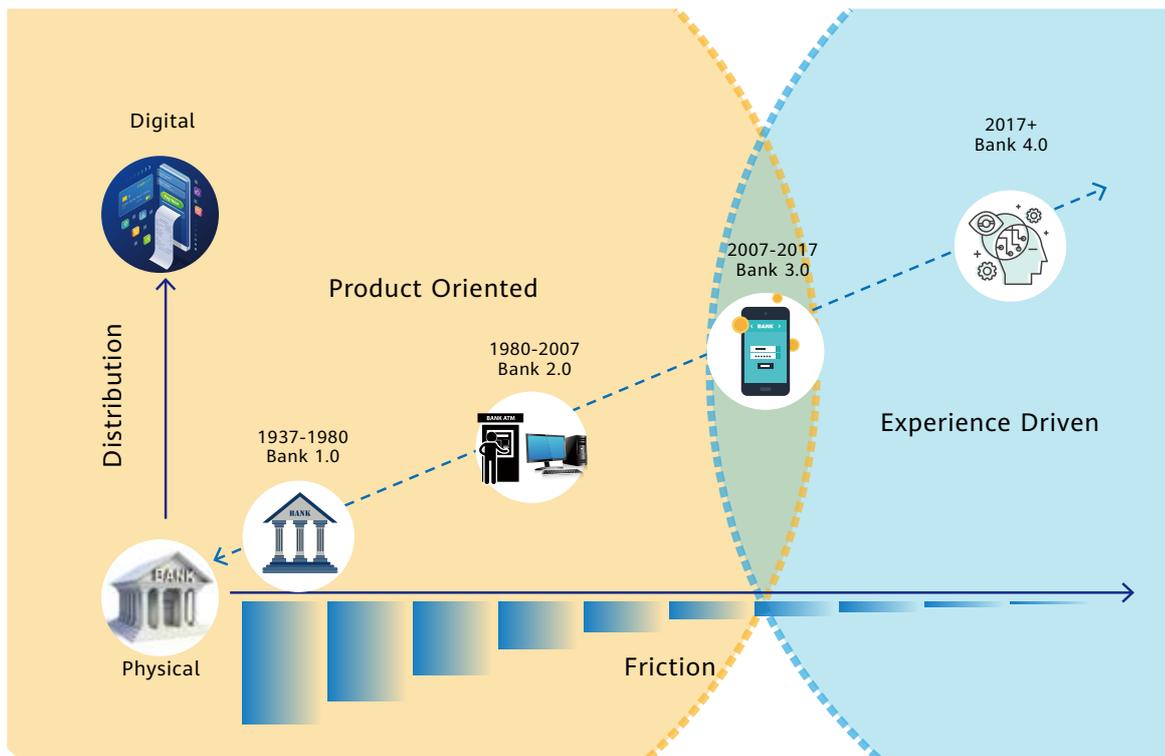


Figure 1: Bank 1.0 to Bank 4.0 Transformation Drivers

many organizations have found productivity increases have come with employees working from home, too. But this is a radical shift from the compliance-heavy structures we find in banks still reliant on 20<sup>th</sup> century organizational thinking.

By 2030, it is estimated that more than 90 percent of the world's population will have access to the Internet through a smartphone. Smartphones are increasingly getting cheaper to manufacture and deploy. Today brand new basic smartphones can be found on the streets of India, South Africa, and Nigeria for under US\$50. By 2030, it's expected that such devices will be available essentially for free, with basic subscription services for access to the Internet. It's expected that tech giants like Facebook, Google, Tencent, Alibaba, and Amazon may move to give away smartphone access to individuals who subscribe to basic services through their infrastructure. By 2050, access to basic internet infrastructure will be all but ubiquitous across the planet, meaning everyone will participate in the digital economy. Cash won't be illegal; you just won't find anywhere to use it — at least that's what William

Gibson predicted in his book *Count Zero*.

*"He had his cash money, but you couldn't pay for food with that. It wasn't actually illegal to have the stuff, it was just that nobody ever did anything legitimate with it."*

— William Gibson, *Count Zero* (1986)

Will branches still exist? Yes, but you won't need them to do banking; in fact, banking will be smart, real-time, and embedded in your life. To think that banking will still be done predominantly in branches instead of on our smartphones would be ludicrous. That isn't even the situation today, where mobile banking transactions outnumber branch interactions by 10,000:1 globally. But the path to global financial inclusion was never going to be through a branch. The smartphone has halved financial exclusion in just 10 years. It took banking 500 years to reach the same level of financial inclusion that the smartphone achieved in a decade.

The future of banking is already here, and it's in your pocket. ▲

# Digitization Safeguards Financial Enterprises in Turbulent Times

*By Wu Shengfei, Market Insight Director, and Lin Zhiyao, Market Insight Expert, Huawei Enterprise BG*

**T**he COVID-19 pandemic has had a huge impact on the financial industry: Governments around the world have lowered benchmark interest rates, reducing interest income levels as a result. Elsewhere, the pandemic has caused total business shutdown in many industries, leading to overdue payments and defaults, increasing the rate of non-performing loans, and degrading the quality of assets. Isolation and quarantine measures have caused financial institutions that rely on physical outlets to cease operations altogether, and some small- and medium-sized financial institutions face bankruptcy.



*The COVID-19 outbreak has had a huge impact on the financial sector. Facing an uncertain external environment, financial enterprises need to deepen digital transformation, and optimize their architectures, capabilities, and technologies.*

Meanwhile, financial companies with strong digital capabilities have quickly pivoted to providing online services, using online channels to carry out marketing and customer service activities. They have continued to provide various financial services, effectively limiting the negative impacts of the outbreak. In unforeseen circumstances, companies need to adapt just like this to protect themselves from an ever-changing external environment. Making the most of next-generation digital technologies and improving the digital level of enterprises is integral to improving coping mechanisms overall, helping them effectively adjust to changes outside their control.

### **Flexible and Open Service Architecture and Scenario-Based Orchestration**

Alongside serious business challenges, fresh complications, and new policies to wrestle with, crises such as the pandemic can also present new opportunities for businesses. To minimize the negative impacts while seizing the opportunity to gain a head start on competitors, enterprises should respond quickly and launch new products and services. For example, during the pandemic, the Agricultural Bank of China — a leading Chinese commercial bank — quickly designed and released wealth management products related to prevention of the pandemic, rolled out online customer services, cooperated with medical institutions to provide remote consultation services, and collaborated with government departments to provide livelihood services. These measures enabled the bank to effectively adapt to the new environment and scenarios.

Traditional service architectures of financial enterprises

have proved unable to adapt to changing service environments, complicating the roll-out of new products and services designed for new scenarios. In an ever-changing world, financial enterprises need a flexible and open service architecture, especially for service processes. While service processes need to be broken down to basic service actions, to form service capability modules, service architecture must support the quick combination and flexible orchestration of service capabilities, so that enterprises can quickly launch new scenario-specific products by orchestrating basic service capabilities. This way, enterprises will be able to make available products and services in new scenarios, ensuring smooth business operations in changing environments.

### **New-Generation IT Architecture Supports Rapid Service Changes**

With the development of next-generation IT technologies, distributed, cloud-native, and microservice architectures are gradually replacing the traditional centralized architecture of financial enterprises. These next generation architectures help enterprises build flexible, agile, and efficient IT platforms. In a rapidly changing external environment that sees the emergence of new service scenarios, they enable enterprises to quickly adapt and launch new applications, products, and services.

During the pandemic, financial enterprises that have turned to next generation architecture have been able to quickly respond to the situation and develop financial services based on epidemic control requirements — affirming the value of next generation IT architecture. For example, the Industrial and Commercial Bank of China



*With the development of next generation IT technologies, distributed, cloud-native, and microservice architectures are gradually replacing the traditional centralized architecture of financial enterprises.*

>>

(ICBC) used cloud computing and distributed technologies to provide contactless financial services for customers around the clock. Based on an open and integrated ecosystem, the bank also launched an emergency material management system and a personnel health information registration management system, to support key units, companies, and communities such as epidemic prevention and control command centers, health commissions, and medical institutions at all levels.

### **Internal Collaborative Office Work and External Customer Marketing and Services**

In recent months, remote working has become an important way for enterprises to continue to deliver services. To build all-online work capabilities, financial companies must take action. These are some courses of action to consider:

#### **Build Remote Working Capabilities for**

#### **Employees on a Collaborative Office Platform**

Financial enterprises should select a suitable collaborative office platform. The platform must support various communication modes between employees — including text, voice, video, and conferences — to meet daily work requirements. Because financial institutions handle large volumes of key information, information security is a priority in remote work, so a collaborative office platform with high security and reliability is needed to ensure the security of financial and operational data.

As well as communication and interaction between employees, remote working also requires remote handling of various service

processes. For the financial sector, process requirements related to risk control and regulatory compliance are crucial. To achieve effective remote working, these service capabilities and processes need to be integrated with the collaborative office platform. The platform must be open and allow the seamless integration of service processes, so that employees can perform business activities such as risk control and complete the entire financial service process online.

#### **Develop Customer-Oriented Online Marketing and Service Capabilities**

During the pandemic, most offline outlets are — or have been — closed, and online financial services have become the only option. Some elderly customers who had been hesitant to use digital services quickly had to learn how to transfer and remit money online, and how to pay for living expenses. They even started to shop online for groceries. That's why some banks switched to online marketing and services, achieving quite impressive results. For example, a bank wealth management executive held a live promotion online, attracting many new customers to the bank.

Online marketing and service capabilities are becoming increasingly vital for financial companies. In China, with the development of Internet technologies, new online marketing and service models have emerged, from text messages and images, through audio and video, to live broadcasting, which is so popular today. Financial companies should analyze the advantages and disadvantages of various marketing and service channels so that they can select the ones to effectively integrate in order to develop an efficient digital marketing system.

### Investing in Financial Technologies and Strengthening Big Data and AI Capabilities

Financial technology has ably demonstrated its value, providing uninterrupted services and online and offline linkage through product and service innovation, in turn ensuring the stable running and business continuity of financial institutions throughout the outbreak in China. This is the conclusion of *Highlighting the Value of Financial Technology in Fighting COVID-19*, a report released by Xinhua Finance along with other agencies.

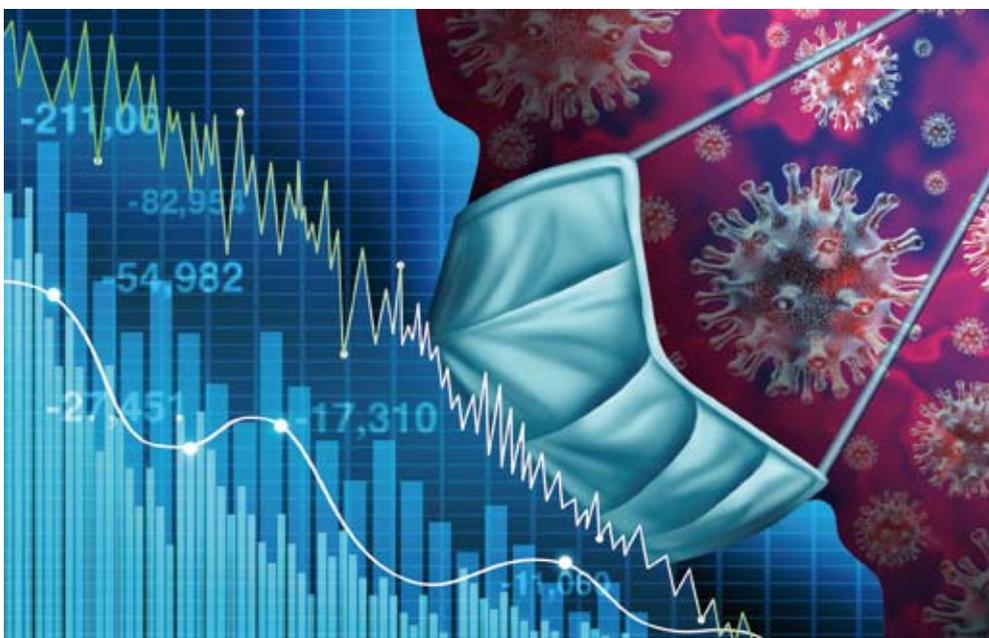
When the pandemic ends, financial institutions should continue to invest in financial technologies, and further integrate technologies such as big data, Artificial Intelligence (AI), and the Internet of Things (IoT) with financial services, so that they are better prepared to cope with future crises. In terms of big data, financial institutions have

high-quality data assets, unrivaled among all industries. Financial institutions should analyze the massive amounts of data they own to extract full value from it. The application of key AI technologies — machine learning, knowledge graph, natural language processing, and computer vision — in various nodes of financial service processes will play an important role in product innovation, process reengineering, and service upgrade, improving the capabilities of financial institutions in marketing, risk control, and customer service.

The COVID-19 pandemic is a unique occurrence that brings huge challenges, but also points to new directions for the development of the financial services industry. To safeguard themselves against the impact of the pandemic — and any future emergencies — financial institutions should continuously optimize their architecture, capabilities, and technology.▲



*Financial technology has ably demonstrated its value, providing uninterrupted services and online and offline linkage through product and service innovation, in turn ensuring the stable running and business continuity of financial institutions throughout the outbreak in China. >>*





# Promoting Inclusive Financial Services to Build a Fully Connected, Digital World

By Li Xianhui, Global Financial Services Business Unit, Huawei Enterprise BG

As digital technologies, the Internet, and mobile communications become more integrated with the financial services industry, financial transaction modes and service models are evolving. Digital, mobile, and intelligent financial inclusion have become significant trends.

At the 2016 G20 Hangzhou Summit, the concept of Digital Financial Inclusion (DFI) was first proposed. According to the G20 Global Partnership for Financial Inclusion (GPFI), DFI refers broadly to the use of digital financial services to advance financial inclusion. The process involves the deployment of digital technologies to reach financially excluded and underserved populations, with a range of formal financial services explicitly suited to their needs and delivered responsibly, at a cost that's affordable to customers as well as sustainable for providers.

Aligned with its vision for a fully connected, intelligent world, where digital services are available to everyone, Huawei aims to use connectivity technology to make inclusive financial services affordable and sustainable. Through various

digital means, Huawei strives to provide equal, effective, comprehensive, and convenient financial products and services for all social groups, especially disadvantaged and low income households, as well as micro and small enterprises.

## Three Features of DFI

DFI differs from traditional financial inclusion in three main ways:

**Wider coverage:** DFI relies on digital technologies such as the Internet and mobile communications to deliver reachable services within signal coverage, under the premise of wide coverage of basic communications facilities.

**More accessible financial services:** Big data technology enables banks and their regulators to better understand

*By applying mobile, data, open architecture, and security technologies, Huawei has developed integrated financial solutions (including mobile wallets, mobile payment, and micro and small business financing platforms) to fuel the growth of inclusive financial services and boost the digitization of banks.*

customers, manage risks, and lower the threshold for financial services. Micro and small enterprises, as well as low income households, have access to financial services such as credit and investment/financing, whereas previously they had difficulty reaching traditional financial services.

**More closely related to people's lives:** Digital inclusive financial services are more scenario-specific. Digital technologies, especially mobile technologies, can be used to integrate financial services into work and general life, improving efficiency and boosting the economy. Financial enterprises can also build one-stop service platforms by providing digital financial services for users.

### **Mobile Communications: Deliver Inclusive Financial Services within Signal Coverage**

In low- and middle-income economies in Africa, the vast majority of economically disadvantaged people are often marginalized from modern financial life and become 'invisible' in the financial service system. They are unable to access savings, insurance, and credit services at an affordable cost. When formal financial services aren't available, they turn to informal financial instruments, such as loans from local non-financial institutions and facilities from rural mutual aid associations. As a result, they

have to pay high service and transaction fees, increasing the costs and risks of financial services.

In recent years, the popularization of mobile communications has provided necessary conditions for the rapid development of the digital economy, significantly boosting financial inclusion. Between 2005 and 2017, the number of mobile users in Africa increased from 87 million to 760 million, with an annual growth rate of 20 percent making it the fastest-growing market in the world. The mobile network coverage rate in African countries now ranges from 10 percent to 99 percent, with an average rate of 70 percent. Through mobile financial platforms such as mobile banking and mobile wallet, transactions are carried out at marginal cost. In other words, it is much easier to provide affordable financial services to the economically disadvantaged. In this context, enterprises will be more motivated to provide formal financial services to meet the needs of low-income groups.

In 2007, Safaricom, a telco with a market monopoly in Kenya, launched M-PESA, a mobile wallet for feature phones that enabled people to transfer money. In 2012, Safaricom started cooperating with Huawei to develop M-PESA's capabilities using new mobile technologies.

M-PESA has grown quickly and become a leading mobile wallet service provider in Africa. The service covers seven countries — Congo, Egypt, Ghana, Kenya, Lesotho, Mozambique, and Tanzania — with 37 million active users and more than 400,000 service agents. These offline agents are often small retailers, post offices, and gas stations scattered in towns and villages, through which people can top up, transfer, pay, and even withdraw money, just like Automatic Teller Machines (ATMs).

With M-PESA continuing to grow, Safaricom also cooperates

#### **About Financial Inclusion**

The idea of Financial Inclusion was first proposed by the United Nations in 2005 — the International Year of Microcredit — and it means, in effect, a financial system that can effectively, comprehensively, and conveniently serve all segments and groups of society.

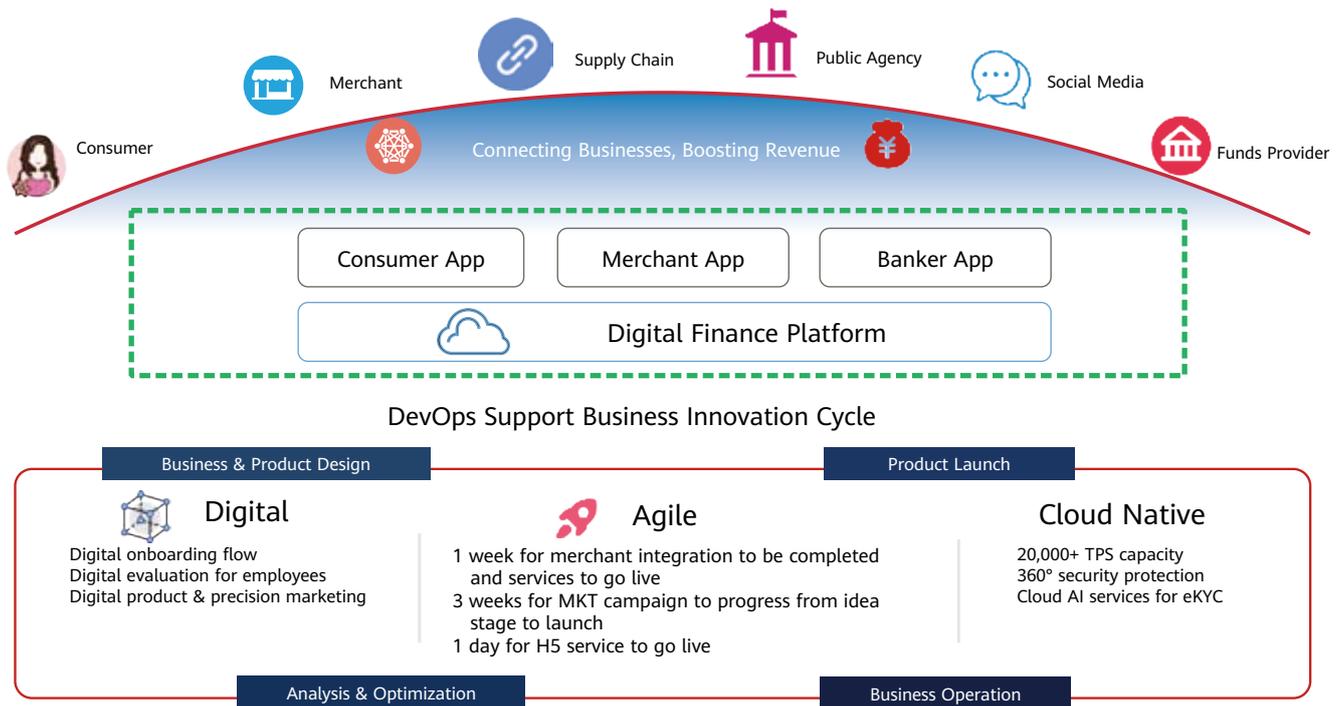


Figure 1: Huawei's Mobile Money Solution

with 25 banks, including NCBA Bank Kenya and KCB Bank Kenya, to provide micro and small deposits and loans through the M-PESA mobile wallet. M-PESA cooperates with these banks on services such as Fuliza, which allows M-PESA customers to complete their M-PESA transactions when they have insufficient funds in their M-PESA account, and m-Sharia, a Sharia-compliant banking service.

Banks are important players in the financial inclusion field. For example, Equity Bank, which has nearly 200 branches and more than 30,000 agents in Kenya, is well-known for its agency banking mode. It is one of the leading enterprises providing financial services to Small- and Medium-sized Enterprises (SMEs) in Kenya.

Overseen by the central bank, third parties (such as shops) authorized by commercial banks can provide financial products to the public and become part of the retail network of commercial banks. These agents provide basic financial services through cellphones for people in remote rural areas where banks don't have branches.

**Digital Technologies: Improve Financial Supervision Efficiency and Support Financial Inclusion**

Integration of finance, the Internet, and technology has

generated many new services, such as mobile payments, online finance, electronic bills, and virtual currencies. As well as being inclusive, financial services are becoming more virtualized and around-the-clock across industries and markets. However, this also has negative consequences: risks spread quickly and are difficult to identify. Traditional financial supervision approaches fail to effectively monitor, identify, control, and cope with these risks, creating a need for supervisory technology. Supervisory agencies use innovative technology to monitor, identify, and cope with risks, maintaining a balance between financial innovation and financial security. Meanwhile, as financial transactions become more frequent, a massive amount of data is generated every day, exceeding the capacity that manual analysis and processing can handle. In these circumstances, supervisory technology is also helpful in improving financial data analysis and processing capacity, reducing costs. In the context of strengthening financial supervision, new, more intricate financial supervision policies are rolled out frequently, and risk prevention and control responsibilities have shifted from regulators to financial institutions. Financial institutions and supervisory agencies need supervisory technology to improve their policy execution, prediction, and supervision capabilities.



*Credit and payment infrastructure is an element of every country's financial infrastructure, and is critical to solving the problems that hinder inclusive financial development, such as information asymmetry and high transaction costs. >>*

Meanwhile, the digital capabilities of financial regulators are improved in three ways.

**Automatic extraction of data:** For example, the central bank of Austria — OeNB — uses the Austrian Reporting Services (AuRep) system as an intermediate platform. After automatically obtaining fragmented raw data of commercial banks, the AuRep system converts the data based on standard rules, and pushes the converted data to the central bank. This greatly reduces the data reporting and compliance burden of the monitored objects and ensures the consistency and quality of data used by all departments of the central bank. The National Bank of Rwanda uses an Enterprise Data Warehouse (EDW) to periodically and automatically extract data from the IT systems of more than 600 regulated institutions, including commercial banks, insurance companies, microfinance institutions, and telcos.

**Strengthened data verification and processing:** To take an example, the Bank of Italy uses suspicious transaction reports (structured data) and news commentaries (unstructured data) to detect money laundering. Data visualization technology can also be used to transfer processed information to regulators in a way that's visualized and easy-to-understand. Another example of this improved data processing can be seen at Dutch bank ABN AMRO, which converts data into logical forms such as traffic signal lights and dashboards. The Monetary Authority of Singapore also uses interactive dashboards and network diagrams to visualize data.

**Cloud computing technology applied to data processing:** To reduce data processing pressure and costs and increase the storage

capacity of regulators, the Financial Conduct Authority of the UK, the National Banking and Securities Commission of Mexico, ABN AMRO, the Monetary Authority of Singapore, and the US Securities and Exchange Commission have all used cloud computing to process massive amounts of data.

To meet the data-processing capacity requirements of financial regulators, Huawei provides a converged data platform solution, which integrates structured and unstructured data management, Distributed Databases (DDBs), and converged data storage devices. It also integrates data virtualization and data enablement platforms, and provides end-to-end solutions covering front-end data access, storage, processing, analysis, and governance for customers in the Financial Services Industry (FSI). Using Huawei's full-stack hardware, this solution helps industry customers optimize performance, from chips to platforms, helping customers build data analysis and processing platforms with improved performance.

### **Financial Infrastructures: A Solid Foundation for Financial Inclusion**

Credit and payment infrastructure is an element of every country's financial infrastructure, and is critical to solving the problems that hinder inclusive financial development, such as information asymmetry and high transaction costs. The progress made by countries in promoting financial inclusion is largely reliant on the construction of financial infrastructure.

#### **Enhance Payment Infrastructure Construction**

In many countries, central banks have led efforts to work with other stakeholders to establish reliable nationwide payment system infrastructure. Meanwhile, countries are



*By June 2019, the People's Bank of China's credit reporting system had collected information about 990 million people and 25.91 million enterprises. Average daily queries of individual and enterprise credit reports stood at 5.5 million and 300,000 respectively. >>*

focusing on the construction and maintenance of payment and settlement infrastructure in remote areas to ensure its stable operation. The construction and improvement of such infrastructure promotes the expansion of the physical networks of financial institutions, improves the diversity and efficiency of payment products, and boosts the digitalization of Government-to-Person (G2P) payments.

#### **Promoting the Digitization of G2P Payments**

In recent years, several countries have implemented policies to benefit farmers, such as subsidies for agricultural workers, new rural pension subsidies, and new rural cooperative medical subsidies. Generally, these subsidies are widely distributed in small amounts. If they are distributed in cash, there are many procedures and the distribution costs are high. To resolve these problems, the Thai government, for example, directly grants subsidies to individuals through the mobile wallet platform of Krung Thai Bank (KTB), binding personal debit cards or Know Your Customer (KYC) information, leading to more people owning and using personal bank accounts. Residents receive subsidies using their bank cards, without needing to leave their villages. By using the bank's KYC information, the government can ensure that the subsidy recipients are correctly identified and traceable, preventing impersonation and misappropriation of subsidies.

Evolution from mobile wallets to digital payments has become a popular way for governments to develop a cashless strategy. This evolution may further improve the experience of inclusive financial services and effectively explore the value of long-tail customers. For example, in Myanmar, Huawei's mobile payment solution has helped

KBZ Bank take a leading position in the mobile payment market within a single year. This solution uses Huawei's core technologies and integrates the innovative spirit of FinTech companies.

#### **Promoting the Construction of the Digital Credit Investigation System**

In recent years, the People's Bank of China has promoted the construction of a credit investigation system to reduce information asymmetry between borrowers and lenders and provide responsible loans to enterprises and families. The Credit Reference Center of the People's Bank of China collects data from more than 3,000 financial service providers, including banks, rural credit cooperatives, microfinance companies, insurance companies, and other non-bank financial institutions. It provides information based on the query requests of these organizations. By June 2019, the People's Bank of China's credit reporting system had collected information about 990 million people and 25.91 million enterprises and organizations. Average daily queries of individual and enterprise credit reports stood at 5.5 million and 300,000, respectively. The enterprise credit reporting system of the People's Bank of China covers 13.7 million micro and small enterprises, accounting for 53 percent of all registered enterprises. Among them, 3.71 million micro and small enterprises have received credit support, with a loan balance of CNY33 trillion (approximately US\$4.7 trillion).

The People's Bank of China has also recognized the role that the private sector, particularly emerging financial technology companies, can play in improving China's credit infrastructure. On February 22, 2018,

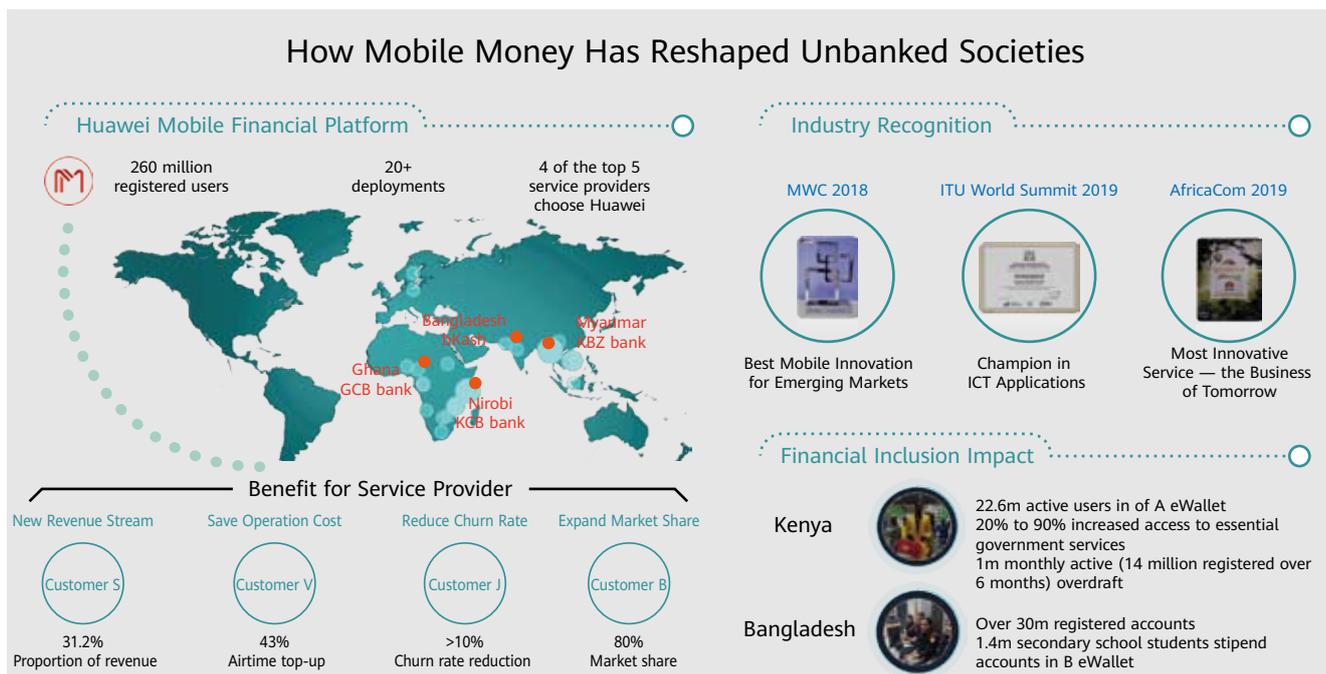


Figure 2: Global Practices of Huawei’s Mobile Money Solution

it released a bulletin on its official website, stating that the personal credit investigation service of Baihang Credit had been approved. The shareholders of Baihang Credit include the National Internet Finance Association of China, which holds 36 percent of total shares, and eight Internet companies: Tencent Credit Information Co., Ltd.; Sesame Credit Management Co., Ltd.; Shenzhen Qianhai Credit Center Co., Ltd.; Pengyuan Credit Service Co., Ltd.; China Chengxin Credit Information Co., Ltd.; Zhongzhicheng Credit Information Co., Ltd.; Lakala Credit Management Co., Ltd.; and Beijing Huadao Credit Reporting Co., Ltd.

Meanwhile, access to more public information through the credit reporting system will facilitate financial inclusion. Government departments such as tax, business, and judicial sectors have a large amount of valuable data related to individuals and micro and small enterprises, but the information is often difficult to obtain. To address data-related issues, China needs to establish a complete legal framework for data and privacy protection, including the use of public information and alternative data.

To meet the requirements of financial infrastructure construction, Huawei provides an Artificial Intelligence (AI)-based credit assessment service solution. Based on the end-to-end service data of mobile wallet, mobile payment, and mobile financial products, Huawei helps financial institutions perform customer profiling and credit assessment.

### Injecting New Vitality into FSI to Build Financial Inclusion

China has a leading global position in promoting financial inclusion development because of its abundance of sophisticated financial technology, especially in payment infrastructure and credit infrastructure construction, which can serve as a good reference point for other developing countries. Chinese companies have also played an important role in FinTech development in Emerging Markets (EMs). Huawei plays a key role in telecom infrastructure construction in these EMs, eliminates the digital divide by building an inclusive connected network, and builds a solid foundation for financial inclusion based on connectivity.

Huawei has become the most important technology and solution provider for mobile financial services. By applying mobile, data, open architecture, and security technologies, Huawei has developed integrated financial solutions — including mobile wallets, mobile payment, and micro and small business financing platforms — to fuel the growth of inclusive financial services and boost the digitization of banks.

Huawei’s Mobile Money Solution has been used worldwide for 10 years, and it serves 206 million users, bringing huge benefits for banks and carriers. With growing cooperation between EMs, boosted by the China’s *Belt and Road Initiative*, Huawei aims to build on its DFI successes and cooperate more with financial institutions in fields such as supervisory technology and FinTech services. ▲

# Empowering the Financial Industry in the Intelligent Mobile Era

*By Cao Chong, President of the Global Financial Services Business Department, Huawei Enterprise BG*

## The Financial Industry Enters a New Era

The global outbreak of COVID-19 has impacted the lives and businesses of countless people, and the transformation to digital business models poses huge challenges to every industry. A new era has arrived, as vertical industries accelerate digital and intelligent transformation, to adapt to new business models and respond to future uncertainties.

During the pandemic, leading digital banks have continued to provide digital and contactless services, allowing customers to access various financial services, manage their finances, and receive financial support — all from the safety of their homes. We have seen that these leading digital enterprises have excelled in terms of their risk resilience, agile collaboration, and market response efficiency. The underlying reason for their success comes from each enterprise's ability to proactively rebuild service processes and the relevant technological capabilities, to further digitalize and personalize their operation models, which in turn enables them to flexibly respond

to changes in the market and provide tailored services for customers.

The digital transformation of financial enterprises starts from digital channels, such as mobile banking, and gradually expands to the digitalization of employees' work arrangements, branch resource management, data management, and risk control policies. With digitalization, managers and employees alike can re-think and redesign the overall operation of a bank, driving the financial industry into the intelligent digital era.

## Accelerating the Digital Transformation of the Financial Industry

For the financial industry, certain measures will be crucial to overcoming business challenges in the long run and will help increase the industry's overall resilience:

**Redesign the customer service journey:** Even though online banking has been widely adopted for many years now, customers still need to frequently physically visit the bank for more





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*In the intelligent mobile era, Huawei – with its vision, insights, solutions, ecosystems, and experts – is uniquely positioned to create new value. The global outbreak of COVID-19 has disrupted the lives and businesses of countless people, and the transformation to digital business models poses huge challenges to every industry.*

*– Cao Chong, President of the Global Financial Services Business Department, Huawei Enterprise BG*



advanced financial services due to regulatory requirements or complexity issues. As bank branches have closed due to the pandemic — drastically increasing the demand for contactless services — banks have begun to focus on improving their online customer service through mobile banking. Financial Technologies (FinTech) can be used to increase the number of services available online, enhance the customer experience through the overhaul of the service journey, and reconstruct the existing services of banks around people's daily online habits. Online services such as making reservations and pre-filling out forms are combined with offline QR code scanning, one-click interconnection services, and cross-selling, enhancing the customer experience while making the entire process more efficient and secure. Banks can also use these technologies to maximize their resource usage and further improve the banking experience for customers.

**Business agility and mobility:** The development of technologies such as 5G, Artificial Intelligence (AI), and the cloud has transformed services: They have become more mobile and personalized, and — notably — card- and cash-free. Moreover, by undergoing digital transformation and

adopting a mobile first strategy, financial institutions are boosting their service agility and relationship with customers. We predict that the main challenge banks will face in the future will come from mobile applications. The core capability of bank operations will be digitalized, including customer acquisition, services, and operations. Meanwhile, the mobile first strategy that had, up until recently, remained largely theoretical, has now become the go-to strategy for the banking industry in the real world. Many leading banks in and outside of China have incorporated this strategy into their organizational principles and key targets. But mobile first isn't merely a strategy; it will fundamentally transform systems, processes, and the organizational culture, with advanced Information Technology (IT) and collaboration platforms in turn digitalizing bank operations. To realize this transformation, financial institutions need to collaborate with partners who not only have a deep understanding of technology, but are also adaptive to changes and prepared to face the future head-on.

**Smart branches:** Technologies such as 5G, Wi-Fi 6, Internet of Things (IoT), AI-enabled smart cameras, and Smart Teller



Machines (STM) will make operations more intelligent and mobile. These smart branches will use newly acquired intelligence to identify customers, measure their temperatures (while the pandemic continues to spread), and guide service processing. With the help of smart tellers, more experts can be involved in the customer service process. New additions to branches such as smart temperature control, smart cameras, and smart experiences will make branches more secure and comfortable for customers, as well as increasing the bank's management and operation efficiency. In addition, branch distribution and resource allocation can be optimized.

**Digital payment:** Today, Internet giants have made mobile payment a must-have service. According to research conducted by market intelligence firm International Data Corporation (IDC), the use of mobile payment has increased by 60 percent in the first quarter of 2020 in some Asia-Pacific markets. As a result of this increase, banks have been grappling with a range of mobile payment issues and need to find ways to provide better support, improve convenience, seamlessly merge with existing banking services, and increase the accessibility for more Internet players.

**Digital customer acquisition and operations:** With the transformation of traditional bank branches and the surge of Internet users, the Internet has become a key channel for banks to acquire new customers. Financial institutions need to not only use the Internet to strengthen digital customer acquisition capabilities, but also the capabilities of big data, AI, and FinTech — such as Electronic Know Your Customer (eKYC) — to better understand customers' needs, mitigate risks, and improve the precision of customer services. Additionally, financial institutions need to use digital means to improve their internal operation capabilities and efficiency.

**Customer communication:** Through their platforms, Internet companies can provide 24-hour support, send relevant notifications, and respond to needs quickly, increasing customer satisfaction and loyalty. Banks — with siloed multi-channel services — are facing ever bigger challenges. The best way forward is for banks to build an interactive platform that offers direct communication with customers, pushes services

in real-time, and responds to customers' needs at any time. Doing so will improve customer service quality and satisfaction immensely.

**Cloud architecture:** Hybrid cloud isn't merely a trend for the digital transformation of banks — it has become a foundation itself. The cloud is always available and resources can be flexibly expanded, enabling financial institutions to improve their resource usage. Additionally, the cloud can provide micro-services and development tools at any time, which banks can use to quickly launch and iterate Internet-native services and products in a collaborative development mode, greatly shortening the Time To Market (TTM) of ideas. Quite simply, the connection of cloud architecture and the Internet enables banking services to be available to customers anytime and anywhere.

**5G+ trend:** 5G and IoT technologies can enable the connection of countless terminals, which will create massive amounts of information and even change the very way information is exchanged. Ultra-broadband — made possible by 5G — broadens the variety of applications, from text and voice services to video, Virtual Reality (VR), and Augmented Reality (AR). Moreover, 5G's low latency and high reliability enable banks to migrate even more services online and connect with a billion individual and enterprise customers. Meanwhile, working together, edge computing and AI enable banks to deploy more personalized service capabilities that are closer to customers; banks can use these technologies to quickly identify customers, improve service capabilities, and guard against risks. Although 5G hasn't yet been widely adopted in the financial industry, the impact of 5G+ applications is potentially huge. 5G+ financial scenarios will enable remote and virtual financial services, and promote the upgrade and transformation of the financial industry. Lending services as well as investment and wealth management can be conducted virtually through smart terminals. To meet enterprises' financing requirements, banks can effectively evaluate overall risks through big data analytics (enterprise business performance), AR (onsite inspection of enterprises), and IoT technologies (mortgage information),

based on 5G. Essentially, 5G+ finance can increase the efficiency of information sharing, which will greatly improve the user experience, increase the transparency of credit and loan information, improve the fund allocation efficiency of financial institutions, and reduce the costs of transaction and risk control. The application of these new cutting-edge technologies will also increase the diversity of financial services and realize more inclusive and flattened financial services.

### Huawei's Vision and Solution for the Financial Industry

With decades of experience in the financial industry, Huawei has served over 1,600 financial customers in more than 60 countries, including 45 of the world's top 100 banks. Huawei believes that, to successfully implement both mobile first and digital transformation strategies, the financial service industry needs to focus on three aspects: connectivity, digitalization, and business agility.

**Connectivity:** Ubiquitous connectivity is the core of mobility and digitalization. Without high-speed, high-reliability, and high-quality network connections, mobile terminals can't provide customers with a rich interactive experience, financial services can't rapidly respond to every customer, and business will become stagnant.

**Digitalization:** With ubiquitous connectivity, all services can be digitalized and offered online, enabling financial institutions to adapt resources to changes in the new era. Indeed, efficiency can only be maximized when financial services and operations shift from a traditional mode to an Internet-native digital service mode.

**Business agility:** The COVID-19 pandemic has revealed the impact of uncertainty on society at large, for millions of people around the world. Financial institutions must respond more rapidly to changes and use digital technologies to adjust their business models, resource capabilities, and measures for risk control, to maintain their leadership and growth.

Huawei's vision is to help customers in the financial industry embrace the new era of mobility and intelligence, realizing full connectivity, digitalization, and business agility. Based on a wide

range of products and solutions, and supported by a global ecosystem, Huawei has launched "ABCDE" — a series of key enablement services and technologies for financial customers.

**Finance Cloud Architecture:** Financial enterprises need to use a new architecture to implement smart financial transformation. Huawei not only offers hybrid cloud, data centers, and service cloudification, but also service continuity and High Availability (HA) disaster recovery, internal networks based on Software-Defined Networking (SDN), as well as storage systems based on dual-active and all-flash technologies. Financial cloud architecture integrates the hybrid cloud with the cloud capabilities of the company's data center to ensure secure and proper use of public cloud resources.

The Bank of China (BOC) is currently collaborating with Huawei to build a hybrid cloud-based financial ecosystem to provide flexible accessibility to financial services. The new architecture supports one billion users and 100,000 transactions per second. BOC's eCommerce platform supports more than 10 million online users while the open third-party service access platform supports more than five million transactions per day. Yet the cost of the new architecture is significantly lower than that of the host architecture. The new architecture also has to provide the data infrastructure required for collecting, storing, and processing massive data, which is integral for the new data platform. In the case of Singapore's DBS Bank, Huawei's full-lifecycle intelligent storage solution has greatly improved its service data storage and access efficiency.

**Smart Branch and Services:** With the continuous growth of mobile services, the role of physical bank branches is changing and needs to be redefined. We believe that the digital and intelligent transformation of branches through the application of new technologies, such as 5G, AI, and cloud, is essential for the current construction of branches: The role of future bank branches lies in the provision of a high-end, convenient, and comprehensive financial service experience for customers. Huawei provides intelligent marketing, connection, management, and security protection solutions for bank branches, and is committed to transforming branches



*With decades of experience in the financial industry, Huawei has served over 1,600 financial customers in more than 60 countries, including 45 of the world's top 100 banks. >>*

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into user-friendly, efficient, and diversified comprehensive financial service centers, with reduced operation costs.

For example, China Merchants Bank customers can reserve services ahead of time through the bank's app so that the branch can prepare the required resources in advance. The branch's smart cameras identify customers as they arrive for appointments, measure their body temperature, send reminders to managers, guide customers into the service area, and efficiently access services through simple operations such as scanning barcodes. With edge computing and IoT technologies, operation personnel can use mobile devices to manage branch security, devices, and resources, as well as dynamically adjust branch operations. In the waiting area, targeted financial service information promotion and interactive devices can be used to improve the customer experience, which will in turn improve customer loyalty. Evidently, the intelligent transformation of branches is still the key development goal for most banks.

**Digital Core:** The core system is a key component of a bank. The core systems of most commercial banks still use centralized architecture. However, with low scalability, high costs, long service provisioning periods, and complex Operations and Maintenance (O&M), traditional core systems are no longer able to meet the requirements of modern banks. Despite this, banks still need to maintain the stability of basic services of the traditional core, as well as quickly build a new digital core to achieve service agility. The digital core must be built based

on open and distributed technologies, to support the rapid development and rollout of new generation applications as well as speed up customer acquisition, enhance the customer experience, and reduce IT costs. In addition, the new digital core must be able to support the construction of a next generation data platform, so that banks can quickly reconstruct the data plane (data lake, data factory, and more).

Huawei has worked with world-leading banking partners, including Sunline Technology, Forms Syntron, and Temenos, to jointly develop a digital core solution for various scenarios. Huawei and its partners use their strengths to build a distributed architecture based on the micro-service concept at the Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) layers. The solution also supports modular deployment of the core systems of open banks and can become a new digital service platform that enables banks to develop "super apps." Over time, the traditional core of banks can be migrated to the new digital core. At a large bank in Thailand, the traditional core system struggled to support the rapid growth of users. Huawei and its partners jointly developed a new digital core solution for the bank, which helped the bank offer benefits to tens of millions of users through a digital wallet feature. In the future, it will carry new services of various ecosystems in addition to taking over traditional services.

**New Data Platform:** Data is the core asset for digital transformation, but traditional databases of financial institutions can't support that digital transformation.



*In the future, 5G, AI, and cloud will impact the financial industry on a huge scale. Huawei has invested heavily in these technologies for many years and has become a global leader in related fields. >>*

Therefore, a new data platform is urgently needed. Huawei has been working with partners to build a new data platform solution that helps financial institutions acquire customers, control risks in real-time, and reshape operation capabilities end-to-end, in order to provide personalized products and an intelligent experience. The solution architecture consists of innovation application, convergent platform, and intelligent infrastructure layers, and provides multiple innovative service applications, such as marketing, operations, and risk control.

For example, the Industrial and Commercial Bank of China (ICBC), which has 500 million customers, has migrated and expanded more than 2 PB of data in the theme data marts, including marketing, mobile banking, financial market, and risk prevention and control over the last three years. They have also replaced their traditional data warehouse platform with a new data platform, which greatly improves platform scalability and system performance, such as query and analysis, and greatly reduces the Total Cost of Ownership (TCO) of the platform. In addition, the platform's ability to analyze customers' use of financial apps in real-time has enabled ICBC to continue to refine the recommendation model and further improve the customer experience.

**Open Ecosystem:** Huawei provides industry-leading digital cloud foundations for customers in various industries and collaborates with many business partners to offer end-to-end solutions. In the finance domain, we have more than 200 solution partners worldwide, with solutions ranging from bank cores, AI chatbots, and intelligent

networks to mobile office apps, business intelligence, and intelligent data pools.

Indeed, there are success cases all around the world. In China, we have worked with partners to build new distributed core systems for multiple banks as well as insurance and securities customers. In Africa, we've worked with our partners to build an inclusive financial credit platform for a leading bank in Kenya. In Southeast Asia, we've built a new digital core system for leading regional banks. Specifically, we've worked with our partners to build a payment ecosystem with banks to enable users without debit cards to enjoy financial services in Indonesia.

Huawei has become a strategic digital transformation partner for multiple global financial institutions, thanks to our technical expertise and strategic investments in the financial industry. In the future, 5G, AI, and cloud will impact the financial industry on a huge scale. Huawei has invested heavily in these technologies for many years and has become a global leader in related fields. To further drive the digital transformation of the financial industry, we will provide customers with superior options based on our open technical architecture, ongoing Research and Development (R&D) investment, and proactive cooperation model, as well as the successful transformation practices of Huawei and global leading financial institutions.

Vision, insights, solutions, partners, and industry experts — these are what Huawei can bring to the financial industry in the mobile intelligent era. We look forward to working with all our customers to help them on their unique digital transformation journey. ▲



# How Should Banks Respond to the Rapid Growth of Mobile Payments?

By *Chen Kun Te, Chief Digital Transformation Officer of FSI, Huawei Enterprise BG*

**T**he eCommerce industry has developed rapidly in China over the last two decades, with eCommerce Gross Merchandise Volume (GMV) reaching CNY32.7 trillion (approximately US\$4.7 trillion) in 2019 — almost double the figure of 2015.

## **Banks Must Adopt a Mobile-First Strategy for Digital Transformation**

Such rapid growth has been facilitated by the rise of mobile payments. Mobile users have been an integral market for

China's booming eCommerce sector in the last decade, with many consumers now preferring to use smartphones instead of computers to shop online. Indeed, as early as June 2013, China ranked first globally in mobile commerce penetration.



***Banks must quickly adopt a mobile-first strategy for their digital transformation, and devise strategies to compete with FinTech giants. Above all, they must focus on attaining and retaining customers.***

Two payment apps account for at least 90 percent of China's mobile payment market: Tencent's WeChat Pay, and Alipay, a third-party payment platform established by Alibaba Group. Alipay's payment services include online secure transactions, transfers, credit card repayments, and cellphone credit recharging. It also provides services for retail department stores, movie theaters, supermarket chains, and taxis. Early on — by the second quarter of 2014, to be precise — Alipay established itself as the biggest mobile payment service provider in the world.

As well as its payment services, Alipay also provides wealth management services such as Yu'e Bao — a money market fund launched in June 2013 by an affiliate of Alibaba that allows users to manage their savings, invest, and make payments.

By 2021, eMarketer projects that 79.3 percent of smartphone users in China will be tapping, scanning, and swiping at the point of sale. By comparison, the figure in the US will be 30.8 percent, and just 22 percent in Germany.

As well as the greater range of mobile payment applications and functions available, COVID-19 is also affecting the way people spend, transfer, and manage their money. With the pandemic bringing unprecedented challenges to countries around the world, many governments have advised their citizens to minimize social interactions. In these circumstances, a World Health Organization (WHO) spokesperson recently recommended the use of contactless mobile payments whenever possible to minimize the risk of transmission involved in handling physical money.

Therefore, the pandemic is having a major impact on the

mobile payments industry, as consumers and businesses have been forced to drastically change their purchasing habits, becoming more reliant on digital payments.

For banks, now is a critical time to reflect and to understand the threats and opportunities presented during this crisis. They must also adapt to the digital world dominated by mobile payments, and devise strategies to compete with FinTech giants. Above all, they must focus on attaining and retaining customers.

To succeed in these circumstances, banks must quickly adopt a mobile-first strategy for their digital transformation in order to attract and retain customers. The primary goals of the transformation should be to improve the user experience, increase process efficiency, reduce operational costs, improve decision-making, and achieve business agility.

### **Critical Areas in Transformation for Global Financial Institutions**

Based on my work at China Merchants Bank (CMB) and in interactions with other global financial institutions, I believe that there are several areas that are critical to success in this transformation — they will require the most focus.

#### **Stabilize Legacy Systems**

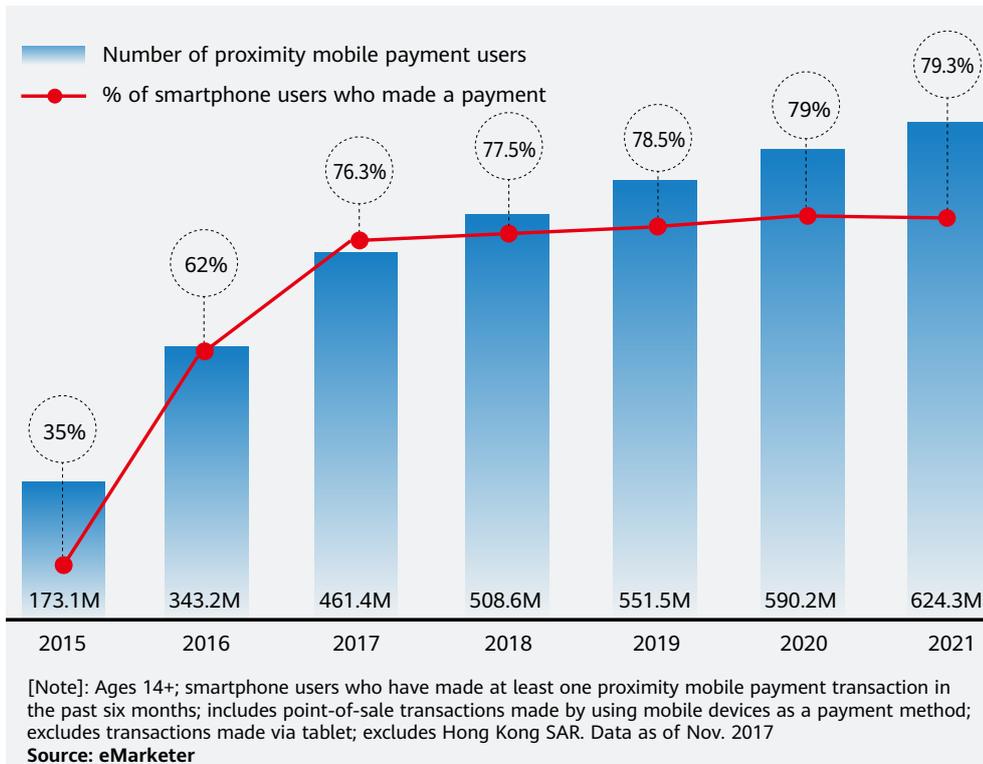
To prevent disruption in ongoing operations, banks have to protect and stabilize their legacy systems while also addressing the need to separate and expose functions of these previously monolithic systems.

#### **Make Mobile-First the Focus for Customer Interactions**

Many IT organizations don't realize that mobile access is how all users will prefer to deal with banks in the future. As a result, they treat mobility as, at best, a separate silo or



*Digital Transformation isn't easy. It takes years to achieve, given the technical difficulty involved, and because its objectives keep evolving. To navigate this complex journey, picking the right ecosystem partner is critical. >>*



#### The swift pace of mobile payments adoption in China

channel; at worst, they see it as an unwanted additional platform that they make little effort to support. Moving to a mobile-first strategy will allow banks to transform, moving from a product-centric to a customer-centric approach across the board.

#### Change the Focus from Transactions to Customer Journey

Traditionally, banks think only in terms of transactions, with the customer simply coming to them to buy a product or service. In the future, however, it will be critical to understand customer behaviors. If banks become adept at meeting such needs, this will only increase the level of customer satisfaction, opening new opportunities for cross-selling. As a starting point, it's advisable

to map out customer journeys for one or two products and integrate them into a mobile banking platform.

#### Find the Right Partners and Engage with Them

Digital Transformation isn't easy. It takes years to achieve, given the technical difficulty involved, and because its objectives keep evolving. To navigate this complex journey, picking the right ecosystem partner is critical. And that entails much more than just choosing a technical service vendor. It's essential to identify a partner that has broad and extensive digital transformation experience, an international perspective, and a global reach. Huawei, of course, is just such a partner. ▲



# AI, 5G, and Cloud: Building Smart Branches for Banks

By Huang Qiuyuan and Kong Xiangyi, Senior Managers for Finance Industry Solutions, Huawei Enterprise BG

## Development Trends of Smart Bank Branches

With the development of the Internet and Financial Technologies (FinTech), Internet finance, mobile banking services, and self-service have become increasingly popular. Indeed, most banking services can now be processed on mobile devices. Given this development, traditional bank branches are seeing a fall in customer traffic, with their customer acquisition ability similarly declining. Meanwhile, with the increasing availability of the Internet and smartphones making access ubiquitous, more personalized mobile financial services — offering a superior user experience — are emerging.

Though it may be tempting to conclude that this will lead to bank branches becoming obsolete, that is not the case. Instead, the development of new technologies — such as

Artificial Intelligence (AI) and 5G — will empower bank outlets by allowing them to become intelligent. Bank branches will therefore still play an important role in the intelligent era, but they will be assigned new functions and have different objectives.

Despite the rapid development of mobile services, e-channels, and self-service, banking branches remain integral in high-value fields, from opening accounts to wealth management and consultancy, and private banking. Indeed, in these scenarios, customers typically prefer face-to-face communication.

Furthermore, branches remain particularly important for brand promotion, as well as delivering an optimal service experience. Only branches can provide an all-round customer experience, improving customer satisfaction and loyalty.



***The next generation of smart bank branches will be scenario-based, lightweight, and mobile. Huawei's "AI + 5G + cloud" platform will make more high-quality bank branch applications a reality, providing strong support for the construction of smart bank branches.***

Indeed, bank branches can connect online and offline interaction activities and promote online and offline service development.

Next generation smart bank branches will involve multiple intelligent, self-service, and remote video devices to provide promotion and training services — improving the customer experience yet reducing labor costs for banks.

Bank branches are evolving to become social and experience centers that are scenario-based. Going even further, they are integrating with other industries as trusted intermediary platforms that provide financial services.

These smart bank branches will also be lightweight. The limited physical space they will take up will be used effectively, and Operations and Maintenance (O&M) will be highly efficient. With this convergence of online and offline functions, a bank's ability to gain new customers will surely improve.

A final, but important, key feature of smart branches will be mobility. 5G wireless connections will be used to provide stable and massive data services, achieving widespread banking services coverage.

### **AI + 5G + Cloud: A Brand New Offline Experience**

Most bank branches in China have been intelligently reconstructed, with service personnel able to identify and categorize customers. More customers are now directed to smart equipment to handle services, while fewer customers are led to the counter. Meanwhile, service personnel are available to offer guidance to customers at any time they need. As well as shortening customer waiting times, online e-bank services also deliver a brand new experience.

Huawei believes that the application of new technologies such as AI, 5G, and cloud can enrich a bank's existing network design, provide a full-journey network experience for customers, and optimize network management modes.

When a customer walks into an intelligent bank branch, service personnel are able to immediately identify the individual customer using a smart device, as an interactive large screen displays the financial products that the customer has browsed on their app. For offline financial management assessment or account checking services, an immersive experience can be offered through Augmented Reality (AR) or Virtual Reality (VR) glasses. Customers don't need to go to a specific branch to handle complex business services; service personnel can contact HQ experts, who are ready to answer customer questions in real time. Elsewhere, the temperature, humidity, and even the lighting of the building can be automatically adjusted in accordance with crowd density and weather conditions.

When customers go to other cities and visit bank branches, their data will be synchronized nationwide. Different branches can continuously optimize the customer route design based on historical service analysis, delivering unique services to each customer. All of these services are enabled by new AI technologies.

Meanwhile, the ultra-high bandwidth of 5G, along with cloud computing, will further enhance the experience at bank branches.

### **Architecture of Huawei's Smart Bank Branch Solution**

Huawei's smart branch solution provides a complete set



Focus



of customer services for banks, inside and outside branches. Through collaboration and sharing, Huawei and partners work together to provide solutions for four banking scenarios: smart marketing, smart connection, smart management, and smart security protection.

**Smart marketing:** Huawei uses AI, big data, and cloud platforms to build a unified online and offline precision marketing platform. With full-stack AI capabilities, Huawei can provide intelligent customer services online and cooperate with partners to provide AI robots that guide customers in branches, greatly improving the customer experience. And while intelligent cameras accurately identify VIP bank customers on arrival, big data analytics of the precision marketing platform

*Huawei has many successful practices in smart banking marketing. For example, in a smart branch of the ICBC in Beijing, Huawei's Atlas AI small cells provide functions such as VIP customer identification and movement track analysis, boosting the marketing capability of the branch. >>*

hosted on HUAWEI CLOUD implements personalized service recommendations and highly customized precision marketing. In addition, Huawei's television set product — Huawei Vision — is used to implement precision marketing and ad pushes, efficiently identifying customer requirements. In terms of service handling at branches, AI automatic identification technologies such as Optical Character Recognition (OCR) speed up service handling and build a comprehensive smart marketing scenario.

Huawei has many successful practices in smart banking marketing. For example, in a smart branch of the Industrial and Commercial Bank of China (ICBC) in Beijing, Huawei's Atlas AI small cells provide functions such as VIP customer identification and

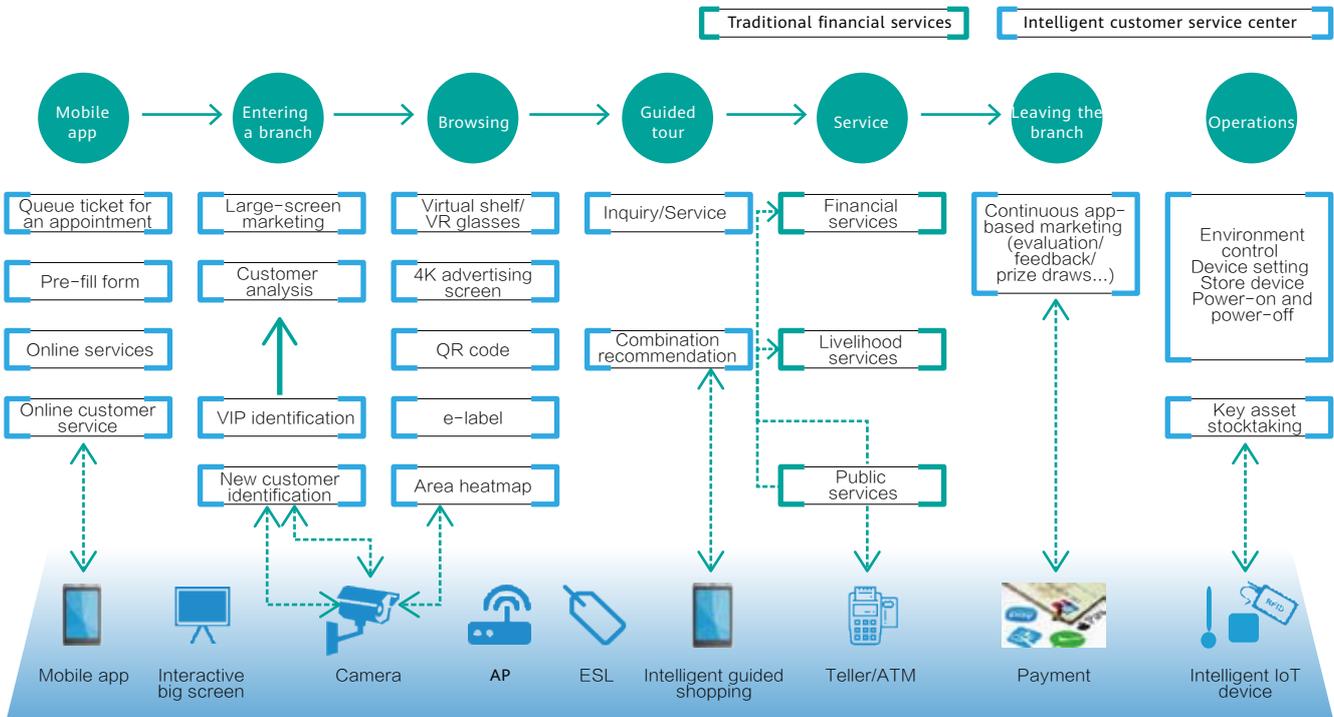


Figure 1: How intelligent technology supports the redesign of branch services to improve the customer journey

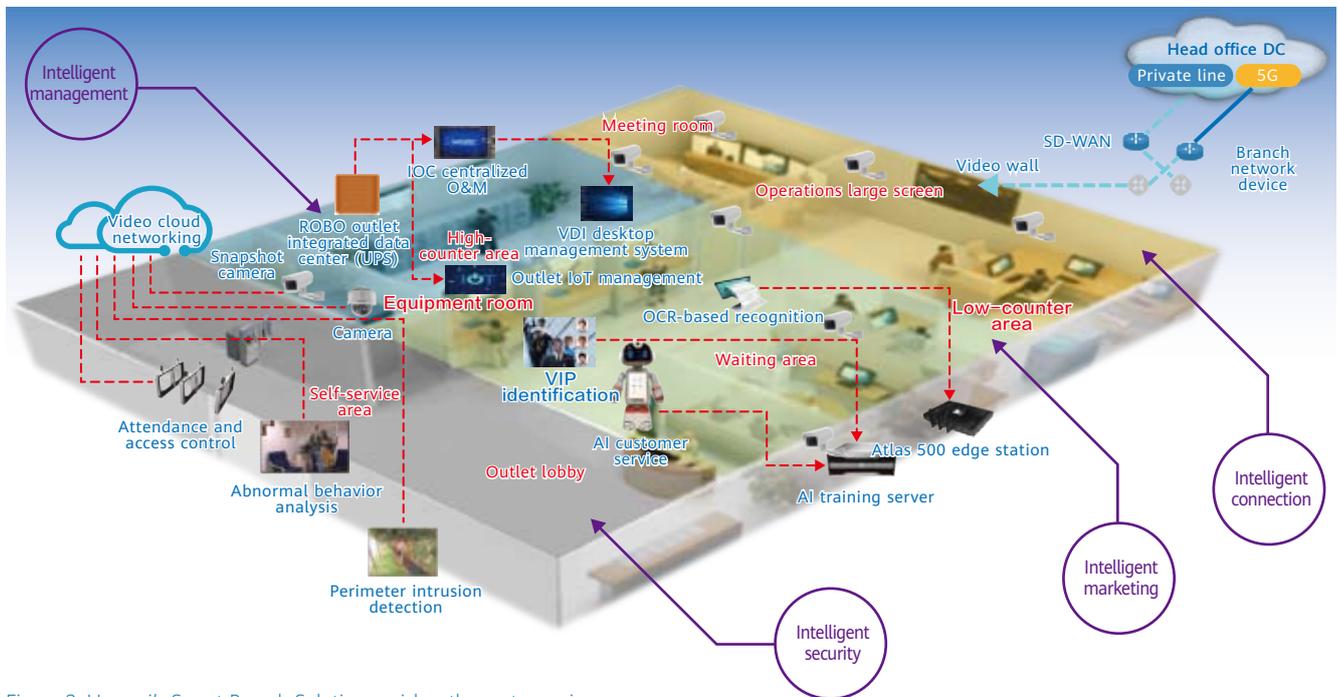


Figure 2: Huawei's Smart Branch Solution enriches the customer journey

movement track analysis, boosting the marketing capability of the branch.

**Smart connections:** With the development of smart branches and the application of multimedia devices, mobile devices, and High Definition (HD) video, high bandwidth capacity becomes essential. Quite simply, ensuring the network quality of branches is crucial. Huawei uses industry-leading 5G technology to provide large-bandwidth network coverage and uses Software-Defined Wide Area Network (SD-WAN) intelligent traffic steering technology to enable intelligent selection of private lines and Internet lines, ensuring maximal bandwidth for the key services of bank branches. Compared with traditional Wi-Fi networks, a Wi-Fi 6 network developed based on Huawei's 5G technology significantly improves network bandwidth, coverage and stability — meeting the wireless requirements of multimedia devices such as tablets as well as HD videos. Huawei AirEngine Wi-Fi 6 provides an outstanding wireless experience for bank customers, helping to support online and offline converged service handling.

Huawei's 5G and SD-WAN products have been successfully applied to the construction of 5G intelligent network points of China Construction Bank, providing customers with a vastly improved network experience.

**Smart management:** Compared with traditional branches, there is a huge amount of both data and IT devices in a smart branch, putting immense pressure on IT operations and management. Huawei's FusionCube solution integrates a branch's IT devices — such as servers, storage devices, and switches — providing functions such as plug-and-play, remote attendance, and edge-cloud synergy, meeting integrated IT device management requirements. Meanwhile, the Intelligent Operation Center (IOC) platform — jointly developed by Huawei and its partners — implements unified, centralized management of O&M of all branch devices at the bank's HQ. The Internet of Things (IoT) asset management system that is deployed, based on Huawei Wi-Fi, provides full lifecycle management, from asset distribution and monitoring, to asset stocktaking and recycling.



*In the future, competition among commercial banks will no longer be limited to business forms, customer groups, and products. Instead, it will focus on higher-level fields such as FinTech, 5G, AI, data management, and account security. >>*

Huawei is working with the Bank of China (Hong Kong) to test its IoT asset management system, with the intention of helping the bank build smart branches.

**Smart security protection:** Security protection is critical to the Financial Services Industry (FSI), and smart security protection is indispensable for branch construction. Based on years of experience in Smart City construction, Huawei is able to provide an end-to-end smart security protection solution for bank branches, and this solution is tailored to the characteristics of bank services. With advanced AI chips, open camera operating systems, and abundant algorithms, Huawei provides a full series of intelligent cameras and video cloud analysis platforms, to implement surveillance functions such as abnormal behavior analysis, mask identification, and detection of loitering, trailing, theft, accidents, and fires. Huawei's solutions also offer internal control detection, such as heat maps inside a branch, monitoring when employees leave the building, and attendance and access control.

Huawei has accumulated a wealth of experience in intelligent security, which it applied when it helped China Post carry out the intelligent upgrade and reconstruction of its security protection system.

### **The Future Bank Branch: A One-Stop Financial Service Center**

With rapid technological development, the transformation of traditional banks into digital, smart banks has become inevitable. Given this fact, to gain a solid foothold in the market — amid intense competition

— commercial banks must seize the moment and tackle challenges head-on. As commercial banks transform themselves, they can offer efficient and convenient services to customers while achieving high-quality development for themselves.

In the future, competition among commercial banks will no longer be limited to business forms, customer groups, and products. Instead, it will focus on higher-level fields such as FinTech, 5G, AI, data management, and account security. With increasingly homogeneous competition, traditional banks must apply technologies such as AI and 5G to overcome technical obstacles, loopholes that create risks, and other issues that arise in smart transformation. Only through radical smartification of financial services, can banks continue to grow and embrace the future.

Huawei has long been committed to working with partners to build more user-friendly and automated branches for banks, providing high-tech experiences for bank customers. Huawei's goal is to develop bank branches into one-stop financial service centers. Branches no longer merely provide traditional financial services. New application scenarios and devices — from AR shopping, simulated car finance, and intelligent customer service robots, to remote interactive entertainment, space capsule-style mobile financial services, and coffee banks — are emerging. Huawei's "AI + 5G + cloud" platform will provide strong technical support to make highly automated and intelligent bank branches a reality. ▲



# Banks Seek New Digital Core to Enable Transformation

*By Chen Ying, CTO, Global Financial Services Business Department, Huawei Enterprise BG*

In the banking industry, the stable running of IT systems is imperative. This is what drove the industry to begin IT construction relatively early and what continues to drive it to make significant investments each and every year. However, the IT architecture of the banking industry — particularly the core system — has stood still for decades.

In 2020, however, it has become clear that banks need to change their architecture. Intelligent mobile Internet technologies — such as 4G and 5G — and intelligent terminals are now popular. Open source technologies based on cloud computing are developing rapidly. And the banking habits of customers are changing fast. In this environment, traditional bank services — from deposits and loans to remittances — are quickly evolving to include payment services (particularly mobile payments) and investment services (which also include wealth management).

Meanwhile, an increasing number of service scenarios are based on Internet technologies, boosting the Internet finance industry. As Internet finance has developed, Financial Technology (FinTech) enterprises have used new technologies

such as Artificial Intelligence (AI), blockchain, cloud, and big data — collectively referred to as ABCD — to quickly gain a large number of customers, particularly millennials, with enhanced business competitiveness.

In China, alongside FinTech companies, Internet giants such as Alibaba and Tencent already occupy a majority of customers' Internet portals through their own Internet business ecosystems, including almost all payment scenarios. These enterprises also encroach on traditional financial service scenarios, posing a huge threat to traditional banks.

## **Digital Banking Trend Gains Momentum**

For banks, as financial markets continue to become increasingly open, financial services are disintermediating, with



***A new digital core is a platform or system that uses new technologies to support digital banking services as banks undergo digital transformation. Though there are various ways in which banks build these new digital cores, transformation to an open and distributed architecture is inevitable.***

traditional interest margins shrinking. An increasing number of newcomers to the market have also exacerbated the decline of intermediate businesses. In these circumstances, traditional banks must not become complacent. Instead, they must digitally transform.

To implement digital transformation, traditional banks require new technologies to reshape businesses and upgrade core business systems, to reduce operation costs, improve risk control capabilities, simplify methods to acquire customers, and optimize the customer experience, as well as enter the long-tail market, which has yet to be penetrated.

Meanwhile, through service transformation and the upgrade of core service systems, the lifecycle of financial products is significantly shortened, with faster service innovation fostered. With such transformation and upgrade, banks can also integrate into — or build — more open banking ecosystems, transforming banks into a Banking as a Service platform that connects various fields, including government, tourism, healthcare, and transportation. This enables banking services to be accessed anytime, anywhere, creating new “digital banks.”

The construction and transformation of digital banks is the new direction for the industry. But it’s not the case that traditional banks are simply trying to transform into digital banks; they’re looking to build entirely new digital banks — also known as “open” or “virtual” banks — instead. FinTech companies have identified huge potential in this area of the banking market, and their aim is essentially to become technology giants with a banking license.

The construction of digital banks needs a suitable market environment. This environment should feature adequate network and smartphone coverage, low loan coverage for

Small- to Medium-Enterprises (SMEs) — which increases the need for digital banking platforms — and FinTech with specific functions.

In terms of services, the process requires scenario-based products, fast market entry, simpler interactions with customers, cooperation in the ecosystem, always-online services — and everything must be connected.

Elsewhere, in terms of technology, digital banks require high performance, high scalability, and high availability. They also need open source technologies, distributed architecture, a micro-service design, and a Development and Operations (DevOps)/Continuous Integration and Continuous Delivery (CICD) outlook and model.

Unlike traditional systems, a new-look digital core banking system must be constructed using new technologies, with support for digital banking services. There are various ways to construct this new digital core in different countries and regions, and for different banks at different stages, but dual-mode architecture is the most common strategy.

### **Dual-Mode Architecture: The Mainstream Architecture of Bank Digitization**

The core systems that banks have developed over several years are supported by traditional IT architecture — stable architecture — and can’t simply be disregarded or rebuilt within a short period of time. However, banks do need new architecture to support applications and services such as mobile payments, small- and micro-finance, and eCommerce in open banking environments. Such applications can’t simply be built and tacked onto the core, stable systems of traditional banks, which are designed for deposit, loan, and remittance services. Instead, most of the new services are cloud-



*Although many banks are migrating service applications from the traditional core to a new digital core, using dual-mode, two-core architecture will continue to be the mainstream approach for many years to come. >>*

native applications, developed based on new technologies — technologies that are open and agile. This is known as an “agile architecture.” A dual-mode architecture therefore consists of two types of architecture: stable architecture and agile architecture.

This new type of agile architecture is generally open, distributed, or cloud-based. Chinese banks and financial institutions have been progressing relatively fast over the last 10 years, not only as a result of the natural evolution of their own business development, but also in the face of competition from domestic Internet companies. And, of course, China is arguably the most developed eCommerce market in the world. During the annual “Double 11” and “Double 12” shopping events, banks — whether traditional or more innovative — need to be able to process massive amounts of online transactions in a very short timeframe. This has driven banks to update their entire technical architecture, to support fast and elastic resource deployment as well as quick iteration of applications, meeting the requirements of fast market changes.

Changes in expectations regarding user experience are also driving traditional banks to quickly develop new applications, such as marketing applications (for flash sales and similar) and non-traditional financial service applications (for life and eCommerce services), with the aim of attracting new customers, particularly millennials. In this context, traditional banks need to quickly build a new digital core based on open and distributed technologies, to better support the rapid development of next generation applications, quickly gain new customers, improve the customer experience, and reduce the overall IT Operations and Maintenance (O&M) cost per

account. This new digital core must also support the construction of a next generation data platform, to enable banks to quickly reconstruct the data plane — with big data, data lakes, and data factories — as well as support the rapid development and deployment of innovative banking services.

Meanwhile, banks still need to maintain the stability of their traditional core, to continue to provide traditional banking services, such as processing savings and general ledgers. As these services have been running stably on traditional platforms for years, any benefits or incentives for changing these services aren’t particularly significant. So, although many banks are migrating service applications from the traditional core to a new digital core, using dual-mode, two-core architecture will continue to be the mainstream approach for many years to come. It’s worth adding that this architecture transformation and service migration is likely to be implemented faster by banks in China than elsewhere.

### **Huawei’s Solution Helps Customers Build a New Digital Core**

IT architecture is the technical foundation that supports the core banking system. For the transformation of bank IT architecture, Huawei usually explores — and combines — two directions: “open” and “distributed” modes. In a distributed mode, the system can be expanded quickly and horizontally, supporting large and non-linear transactions, and this is closely related to the entire architecture design. Traditional bank architecture is centralized and difficult to expand horizontally. However, x86-based architecture and various open distributed technologies — including the MySQL database



**Focus**

and Hadoop — are easy to expand horizontally, for example, WeBank’s Extensible Markup Language (XML) architecture.

During open distributed architecture trials, many technical problems faced by the industry have been successfully resolved. Multiple large-scale practices have been implemented as a result. WeBank has been a good example of this. Other banks, such as China Minsheng Bank and MYbank, have followed suit, building new open banking system architecture based on open distributed technology. Although the progress of many banks outside China has been relatively slow in this regard, they continue striving to gradually transform a traditional core into a new core, moving mainframes and mid-range computers closer to users. Even though the entire industry will maintain a traditional architecture (or core) for the foreseeable future, the transformation to new architecture — a digital core — is a trend that has now become



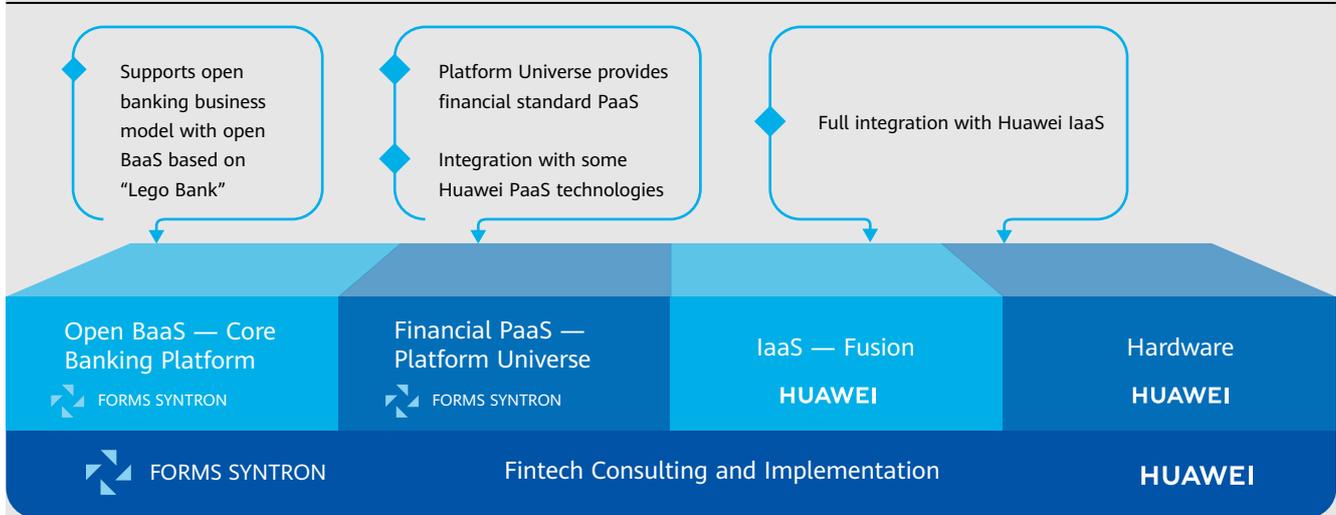
*Huawei is dedicated to promoting the successful digital transformation of banks that we’ve seen in China over the past 10 years, to overseas banks. In particular, the construction and transformation of a new digital core and architecture has been very successful. >>*

irreversible.

The Global Financial Services Business Unit of Huawei’s Enterprise Business Group is dedicated to promoting the successful digital transformation of banks that we’ve seen in China over the past 10 years to overseas banks. In particular, the construction and transformation of a new digital core and architecture has been very successful.

Since 2019, Huawei has worked in China with the banking service provider Forms Syntron to develop a solution called Fincube. This solution helps banks easily build a distributed banking digital core system that converges Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) layers. Huawei also provides the IaaS infrastructure architecture and distributed storage technology based on HUAWEI CLOUD, while the partner provides fully distributed PaaS technologies and modular digital banking

**Fincube — An Open Digital Core Banking Solution**



- IT planning, architectural design, and system integration services through collaborations with suitable local vendor
- Joint labs for continuous innovation



systems that can flexibly adapt to various service development and O&M scenarios. Since it was launched, this solution has become popular among customers, and it was quickly put into commercial use by a leading bank in Thailand. The solution meets the development requirements of the bank's Internet financial services — such as digital wallet and mobile payments — and increases system processing capability from hundreds of Transactions Per Second (TPS) to thousands per second. This will increase to tens of thousands in the future. As a new digital banking platform, it supports the bank's open banking development strategy and connects its ecosystem partners in the government, education, healthcare, and transportation sectors. In the future, it will also help the bank execute important national financial service development strategies and new banking ecosystem business models.

Huawei has also worked closely with MuRong Technology — another leading Chinese provider of bank software — to help a major Kenyan bank quickly build a new digital core system, based on inclusive financial services. This helped the bank to implement its inclusive financial strategy to quickly obtain customers and issue small- and micro-loans in five East African countries. Compared with traditional systems, the bank's new digital core significantly improves transaction capacity and performance, and provides intelligent data service functions such as real-time risk control and intelligent risk control through the introduction of a Huawei big data processing platform and distributed database technologies. With these

*Many large-scale banks, along with fast-growing banks in China, have adopted good practices in terms of building new digital cores and transforming their IT architecture. As a result, customers outside China have been able to see first-hand what the future could look like. >>*

improvements, both the bank's ability to gain new customers and its asset quality have been greatly improved, along with its overall competitiveness in the region. There are, of course, many more success stories to be told, including Huawei's regional and global cooperation with leading banking system providers such as Sunline Technology and Temenos.

Through various channels and Huawei's exhibitions, it's apparent that many overseas bank customers are extremely interested in the new IT architecture and digital transformation of numerous Chinese banks in the past five to ten years. Indeed, the development of the technologies in the real world has proved that an open distributed architecture is feasible for the banking industry. However, without large-scale and long-term application verification, many banks would simply refuse to follow suit.

Many large-scale banks, along with fast-growing banks in China, have adopted good practices in terms of building new digital cores and transforming their IT architecture. As a result, customers outside China have been able to see first-hand what the future could look like. The Chinese example is leading to rising confidence in transformation.

As a global ICT solutions provider, Huawei aims to bring the solutions and best practices applied in the Chinese banking industry to more bank customers outside China. Indeed, the biggest value that Huawei can contribute to the global financial industry is its ability to replicate successful practices in China on a global scale, empowering the digital transformation and success of global financial customers. ▲



# Huawei's Converged Data Lake Solution Accelerates Service Innovation in Banking

By Qiu Yao, Solution Director, Global Financial Services Department, Huawei Enterprise BG

## A Converged Data Lake: The Most Popular Way for Financial Institutions to Construct Data Platforms

A data warehouse system has long been an important part of enterprise IT architecture, especially for traditional industries that rely on digital technologies, including the banking industry. Indeed, a data warehouse plays an increasingly critical role in traditional supervision and reporting as well as in business intelligence, which has become an increasingly important concept over recent years.

Indeed, with the rapid development of mobile technologies — especially the mobile Internet — online, mobile, and scenario-based financial services have become mainstream, resulting in the explosive growth of diverse data types. Processing capability requirements of traditional data warehouse platforms range from hundreds of gigabytes (GB) to hundreds of terabytes (TB). A large modern bank generates several TB — or even dozens of TB — of data every day, and the amount of new data every year reaches the petabytes (PB) level.

Meanwhile, as banking services are more and more integrated with the everyday lives of customers, a large amount of unstructured data is generated on a daily basis, from tracing point data and transaction logs, to images and audio and video data. This represents a significant challenge for traditional data warehouse platforms that process just a single structured data type and a limited amount of data. To tackle it, it is therefore imperative that IT managers reconstruct existing data warehouse platforms in order to process massive, diverse data and support data-driven service innovation.

### Challenges Traditional Data Warehouse Platforms Face

Traditional data warehouse platform costs are high, accounting

for a large proportion of an IT department's spend, both in construction and subsequent capacity expansion. For example, a medium-sized bank will invest millions of dollars in its data warehouse platform each year; for a large bank, this figure may reach tens of millions of dollars.

A traditional data warehouse also lacks real-time analysis capability. With the increase of both data volume and user scale, traditional data warehouses therefore can't meet Service Level Agreement (SLA) requirements for real-time analysis, including real-time anti-fraud measures.

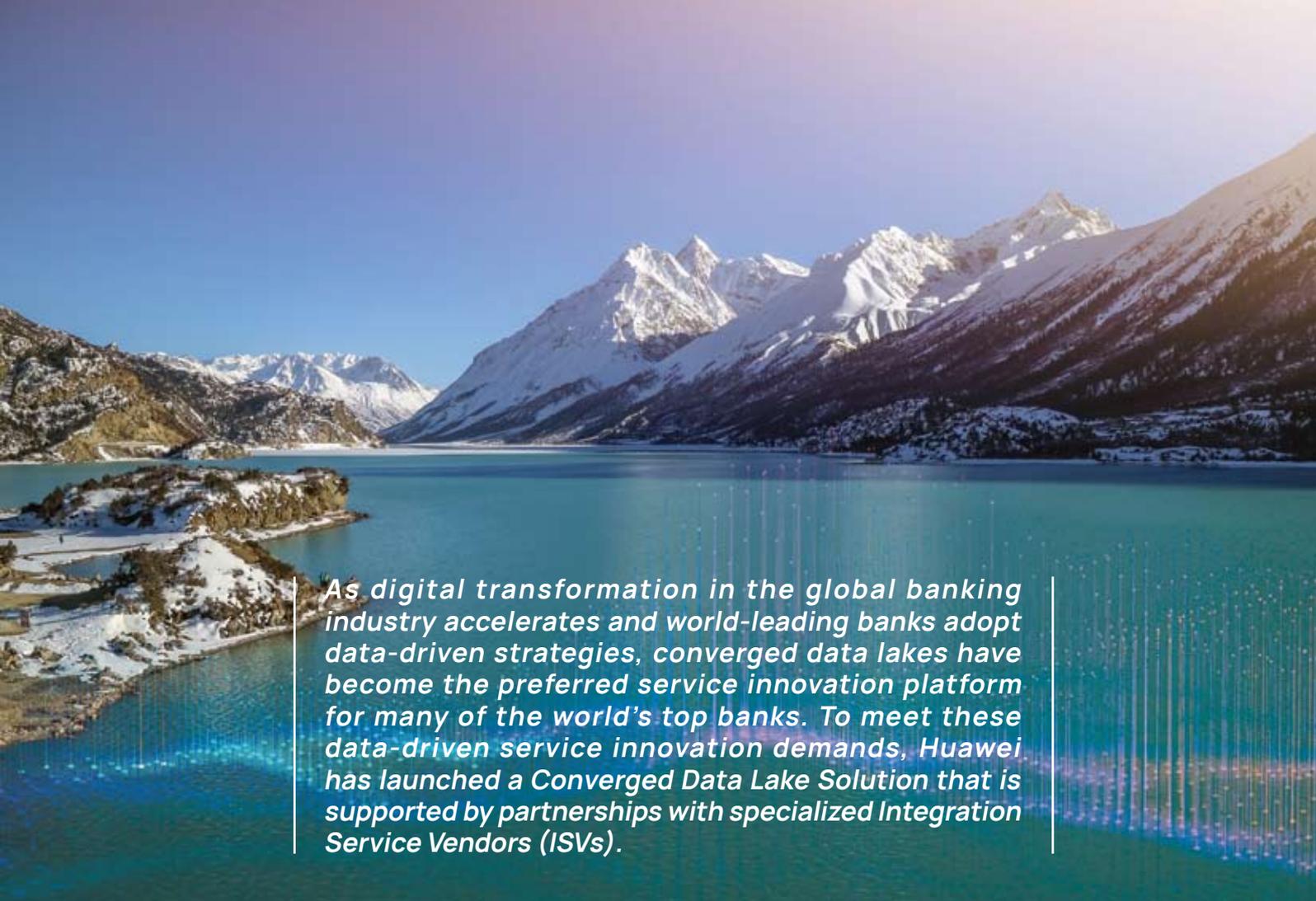
Traditional data warehouses are also mostly relational databases and lack diverse computing capabilities, and are weak when it comes to processing semi-structured and unstructured data.

They also can't offer online capacity expansion. Rather, on a traditional data warehouse platform, existing service systems are usually suspended during capacity expansion. And, as the scale of data increases, capacity expansion becomes increasingly time-consuming, posing a real challenge to service continuity.

Finally, traditional data warehouse platforms use an all-in-one architecture, which fails to meet banking's strategic requirement for IT architecture platform decoupling.

### Development Trends of Future Data Platforms

Open distributed architecture is key to the future. Indeed, an open platform combined with a Massively Parallel Processing Database (MPP DB) has become the preferred choice for an increasing number of large financial institutions. Open distributed architecture helps financial institutions decouple software from hardware, provides processing capabilities for massive amounts of data, and supports linear platform



*As digital transformation in the global banking industry accelerates and world-leading banks adopt data-driven strategies, converged data lakes have become the preferred service innovation platform for many of the world's top banks. To meet these data-driven service innovation demands, Huawei has launched a Converged Data Lake Solution that is supported by partnerships with specialized Integration Service Vendors (ISVs).*

expansion.

Real-time service decision-making capabilities will also be critical. Real-time processing has become a universal requirement for banks around the world seeking to deliver real-time services and a personalized user experience. Indeed, real-time processing capability is now a basic requirement for banks when building a data warehouse platform.

Banks also require the ability to process diverse types of data. Data platforms must therefore be capable of storing, processing, and analyzing structured, semi-structured, and unstructured data. By applying the latest technologies, financial institutions are able to mine and analyze the different data types they own, to create more value.

Financial institutions and banks now need always-on services that are uninterrupted even during system expansion and upgrade; quite simply, 24/7 operations are essential for mission critical service systems.

Finally — and unsurprisingly — integration with Artificial Intelligence (AI) platforms is also essential. Financial institutions are increasingly exploring the application of AI in more and more fields. AI depends on data, and this means that integration with an AI platform must be a

key consideration when planning and constructing a data platform.

#### **A Converged Data Lake Is the Main Direction for Data Platform Construction in the Financial Sector**

Integrating distributed data warehouses and big data processing platforms, a converged data lake processes structured and unstructured data simultaneously, as well as being able to process both real-time and offline batch data. Such a platform also supports the processing of massive amounts of data through distributed linear expansion. As more and more financial services are made available online and on mobile apps, the customer experience is continuously improving; a converged data lake has become an important platform for banks to deliver customer-centric, scenario-based financial services, and a way to implement rapid service innovation.

#### **Huawei's Converged Data Lake Solution**

Huawei is the only vendor in the industry that can provide a converged big data platform (FusionInsight MRS), a distributed data warehouse platform (FusionInsight DWS), an AI development platform (ModelArts), and a distributed



Focus



storage solution. Huawei's self-developed data virtualization platform and data enablement platform — including data governance (DAYU) and data integration (ROMA) — are integrated to provide end-to-end solutions for financial customers, including data access, storage, processing, analysis, and governance. Huawei's full-stack hardware also allows industry customers to conduct chip- and platform-level performance optimization, empowering them with impressive data analytics and processing capabilities, accelerating data-driven service innovation.

*As more and more financial services are made available online and on mobile apps, a converged data lake has become an important platform for banks to deliver customer-centric, scenario-based financial services, and a way to implement rapid service innovation. >>*

a world-class bank — defined its data-driven strategy in a digital transformation blueprint launched in 2015. To execute this strategy, the bank selected an open architecture-based distributed data platform to cope with the challenges brought by the surge of service data and the need for rapid service innovation.

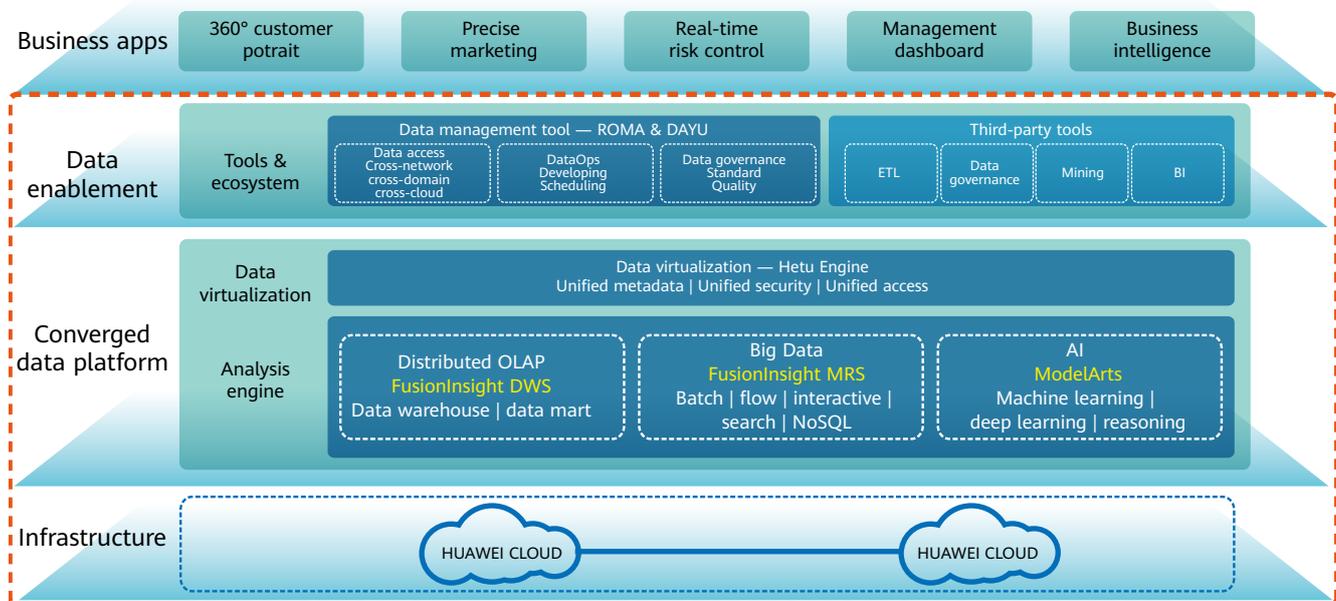
Before this transformation to a distributed data platform, Bank G faced significant challenges.

The bank was under tremendous cost pressure in both early-stage platform construction and follow-up capacity expansion. From 2005 to 2015, Bank G paid a data warehouse vendor as much as CNY800 million (approximately US\$113 million), and its average annual maintenance cost reached tens of millions of yuan.

Furthermore, traditional, closed appliance architecture was in direct conflict with the

### Building a Converged Data Platform for Global Top Banks

With the rapid development of mobile Internet technologies — especially the widespread use of mobile payments — China's traditional financial institutions face fierce competition from emerging FinTech companies. Bank G —



Huawei's Converged Data Lake Solution



*Huawei's self-developed data virtualization platform and data enablement platform – including data governance (DAYU) and data integration (ROMA) – are integrated to provide end-to-end solutions for financial customers, including data access, storage, processing, analysis, and governance. >>*

bank's technological decoupling strategy. Indeed, many financial companies — heavily reliant on innovative digital technology — are frustrated by such vendor lock-in.

The bank also urgently needed to upgrade its online services. Given the twin pressures of increasing customer demand for an improved service experience and the need for efficient and timely service reporting, Bank G's traditional data warehouse platform was simply unable to accommodate online capacity expansion.

There was also a severe lack of real-time data processing capabilities. Traditional data warehouse platforms are, of course, based on offline analysis and processing, and they lack real-time capabilities in Internet scenarios. In particular, traditional data warehouse platforms can't handle real-time data flow processing for anti-fraud operations.

Traditional data warehouse platforms are mainly used to process relational structured data and can't handle the diverse — semi-structured and unstructured — data generated in mobile Internet scenarios, including log and tracing point data, voice, and images. In pursuit of its data-driven strategy, Bank G opted for a data platform that had the ability to analyze, process, and explore these diverse types of data.

After evaluating platforms of multiple vendors, Bank G chose Huawei's converged data lake platform for two main reasons. Firstly, Huawei has years of experience in data platform technologies, and its big data platform has been successfully deployed by many global customers, including the large-scale deployment of more than 10,000 nodes by Huawei's consumer business, as

well as deployments of thousands of nodes by global Tier-1 carriers. Indeed, one of China's most innovative banks, Bank Z, has developed many new applications based on Huawei's data platform. Secondly, the data warehouse platform and the big data platform are integrated in Huawei's solution, which supports the future development trend toward converged data lakes and data warehouses. Huawei also provides a complete data migration solution to ensure smooth data migration from a legacy platform to the new platform, achieving zero data loss and zero service interruption.

After investigation and analysis, migration solution design, solution verification, and solution implementation, Huawei helped Bank G replace all of its traditional data warehouse platforms in June 2019, completing the smooth migration and deployment of nearly 1,000 nodes and more than 2 PB of data in the production environment, ensuring service security.

As digital transformation in the global banking industry accelerates and world-leading banks adopt data-driven strategies, converged data lakes have become the preferred service innovation platform for many of the world's top banks. To meet their data-driven service innovation demands, Huawei partners with specialized ISVs. And while many leading banks in China have already deployed Huawei's data lake platform solution, mainstream banks in Malaysia, Singapore, and Nordic Europe are beginning to follow suit. If the future for the finance sector is data, now is the time to upgrade legacy infrastructure or risk being left behind.▲



# Intelligent Financial Network Paves the Way for the Bank 4.0 Era

By *Kevin Hu, President of Huawei Data Communication Product Line*

**T**he Bank 4.0 era encompasses the full digitalization of the banking industry. Simply put, banking services will be available in real-time — anytime and anywhere — intelligently tailored to individual customers and integrated across the industry. In the Bank 4.0 era, banking no longer revolves around physical spaces as it did in Bank 3.0; rather, it is lifestyle-based. New technologies — such as Artificial Intelligence (AI), Internet of Things (IoT), 5G, and blockchain — provide more possibilities for the development of smart banking services. Future banks will therefore be customer-centric, providing users with omnichannel, seamless, and customized products and services.

New technologies are powering service agility and digitalization. Banks therefore must use them to digitally upgrade, anticipating the ubiquitous services to come. In the Bank 4.0 era, networks are more than simply connections, though; they're also the key to improving the operational efficiency of the brain of smart finance, enabling intelligent decision-making. To support always-on services that are available anywhere, Huawei has launched its Intelligent

Financial Network Solution, which is defined by four characteristics: ubiquitous connectivity and accessible services; distributed architecture and agile service provisioning; intent-driven capabilities and fast closed-loop business; and AI-powered autonomous driving networks.

## **Ubiquitous Connectivity and Accessible Services**

The rise of Internet finance has significantly reduced the



***In the Bank 4.0 era, networks are more than simply connections; they're also the key to improving the operational efficiency of the brain of smart finance and enabling intelligent decision-making. To support these developments, Huawei has launched its Intelligent Financial Network Solution, which features ubiquitous connectivity, distributed architecture, intent-driven capabilities, and autonomous driving.***

footfall of traditional banking branches, prompting banking branches to transform to increase revenues while reducing costs. In the Bank 4.0 era, bank branches will be transformed, from conventional transaction centers into marketing and experience centers. These intelligent banking outlets will be service-oriented, featuring hybrid operations that involve unmanned and mobile banking. They will go beyond merely offering products: Customers will receive comprehensive and intelligent financial services with no waiting times, making service transactions more efficient and far more user-friendly.

Huawei's intelligent financial access network provides intelligent, agile, and ubiquitous connectivity, meeting the needs of multi-tenant hybrid operations and enabling the smart upgrade of multiple banking outlets. Through the Software-Defined-Wide Area Network (SD-WAN) Solution, the network dynamically identifies service types and provides access on demand, ensuring an excellent service experience. The intelligent security system of banking outlets provides differentiated services for VIP users, who are identified through facial recognition. It can also detect suspicious behavior — such as loitering, trailing other customers, and gathering in groups — to ensure transaction security. The Virtual Teller Machine (VTM) system applies the high bandwidth of 5G SD-WAN to eliminate the need for expensive cross-region private lines, by allowing banking outlets to directly access their headquarters' data center for remote agent services.

Meanwhile, all-access network devices support new capabilities, such as deployment by scanning a barcode, zero-touch configuration, and service provisioning in minutes. These capabilities enable fast network deployment and

make financial services more accessible. This was ably demonstrated when China Construction Bank (CCB) and Huawei jointly built the world's first 5G+ smart banking outlet. By providing high-tech services, such as financial space capsules, smart teller machines, and simulation robots — all over the ubiquitous network — the banking outlet was transformed into a customer marketing services hub. As well as improving transaction efficiency and reducing wait times, such a technologically-advanced banking outlet provides customers with an improved experience throughout the entire banking process, enabling customers to access immersive and personalized financial services.

### **Distributed Architecture and Agile Service Provisioning**

Banking 4.0 uses IT technologies to provide customers with banking services anytime, anywhere. To achieve this, a distributed transformation of the core financial system is necessary. Traditional centralized architecture is hard to expand, slow to deliver, and expensive to upgrade or expand (in terms of capacity). In contrast, distributed architecture delivers a 99.999 percent system availability and supports over 10,000 servers (compared to 10 hosts). The communication between servers migrates from internal buses to network buses, and applications can be deployed across regions and data centers. However, distributed financial architecture also poses new requirements for financial networks, including high-quality lossless transmission and fast deployment of micro-services across data centers.

In data centers of the Bank 4.0 era, the performance of computing and storage components must be improved by



*Huawei's Intelligent Financial WAN Solution is based on the SRv6 protocol. It uses a controller to implement one-click delivery, achieving End-to-End automated service deployment and reducing network deployment time from months to minutes. >>*

hundreds of times, highlighting the extent of congestion-triggered packet loss suffered on conventional Ethernet networks. Even in a low-load traffic environment, with link bandwidth usage below 10 percent, burst traffic leads to a network packet loss rate of nearly one percent on a traditional network — enough to reduce computing power by almost 50 percent in the AI era. Packet loss is further exacerbated by the increase in service loads and incast traffic in distributed architecture. Huawei's intelligent financial data center network uses the industry's first data center switch equipped with a high-performance AI chip — CloudEngine 16800. The switch achieves zero packet loss on the network and harnesses 100 percent of AI computing power. To date, Huawei's intelligent financial data center network has been deployed by several leading financial institutions, including China Merchants Bank, Ping An Technology, and China CITIC Bank — ensuring the efficient operation of the brain of smart finance, supporting high-quality decision-making, and unleashing the power of intelligence.

The popularity of Internet finance services is driving the evolution from active-active redundancy across three data centers in two sites to multiple data centers in multiple sites. The on-demand streamlining of services of the same type in multiple data centers poses new requirements for inter-cloud resource management and scheduling. Huawei's Intelligent Financial WAN Solution is based on the SRv6 protocol. It uses a controller to implement one-click delivery, achieving End-to-End (E2E) automated service deployment and reducing network deployment time from months to minutes. This speeds up service provisioning, improves operational efficiency, and cuts Operating Expense (OPEX).

### **Intent-Driven, Fast Closed-Loop Business**

Agile service provisioning requires an increasingly short iteration period. However, when new services are provisioned on conventional IT architecture, the operations involve applications, networking, servers, and storage. Typically, this process takes two to three months, failing to meet the rapidly changing requirements of Internet finance. By introducing a platform that supports integration of management, control, and analysis, Huawei's Intelligent Financial Network Solution effectively connects physical networks and business intents, providing integrated network management as well as rapid integration of Information Technology (IT) and networks, through open Application Programming Interfaces (APIs). This approach covers the entire lifecycle, including network planning, construction, maintenance, and optimization.

**Planning:** In intent-driven planning and design, a common network design for each domain is modeled and standardized then centrally managed to form an online design model library.

**Construction:** Automated deployment enables service intents to be automatically converted into network configurations. Moreover, a cross-domain orchestration system is introduced to ensure E2E automated service provisioning.

**Maintenance:** Intelligent Operations and Maintenance (O&M) includes monitoring and visualization of the health status of Network Elements (NEs) along with the entire network, as well as automatic analysis of the root causes and impacts of network faults, facilitating intelligent decision-making.

**Optimization:** Various O&M data guides system decision-making, delivering automated closed-loop troubleshooting and proactive network optimization, forming a large closed-loop system throughout the entire network lifecycle.



The main aim of the closed-loop system is to accelerate closed-loop business, provide optimal network assurance for diversified financial services, improve network operation and management, shift from a network-centric to a service-centric focus, and build a next-generation, business logic-oriented network that features full-lifecycle automation, intelligent O&M, and an intent-driven closed-loop.

### AI-Powered Autonomous Driving Networks

The Internet of Everything leads to a massive number of devices and connections, with multi-dimensional Service Level Agreements (SLAs). As a result, there is a large amount of data to be collected, analyzed, and processed. In traditional O&M, the Network Management Systems (NMS) merely performs basic processing and simple display of the collected device data. Data analysis is performed manually, which is both time-consuming and labor-intensive. O&M engineers need to become familiar with protocols and the entire service processing procedure. Put simply, traditional O&M now fails to meet the network O&M requirements of the Bank 4.0 era, so AI must be applied to network O&M. Automated analysis and intelligent processing of a large amount of data generated on the network have proven to be the best practices in the industry to cope with network O&M challenges.

O&M is based on big data visualization. Refined visualization can improve the efficiency of handling O&M problems. For complex problems, in-depth root cause analysis is needed. In these circumstances, an O&M knowledge graph needs to be constructed. The system uses Machine Learning (ML) to constantly add new rules to the troubleshooting rule library and optimize

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*Huawei uses AI to achieve intelligent O&M of data center networks. Huawei's Intelligent Financial Network Solution can detect 75 types of common faults within one minute, locate them within three minutes, and rectify them within five minutes.>>*

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judgment criteria, continuously improving the coverage and accuracy of fault identification. As well as proactive identification, the system dynamically generates baselines through ML of historical data. The comparison between the baseline and real-time data helps to predict potential faults and identify network indicator deterioration before services are interrupted. In addition, the system can forecast future network services and guide network adjustment.

Through joint innovation with customers such as China Merchants Bank and the People's Insurance Company of China, Huawei uses AI to achieve intelligent O&M of data center networks. Huawei's Intelligent Financial Network Solution can detect 75 types of common faults within one minute, locate them within three minutes, and rectify them within five minutes. Based on autonomous driving network architecture and predictive maintenance, Huawei's Intelligent Financial Network Solution is committed to delivering network autonomy and self-healing.

### Intent-Driven Network for Banking Everywhere

Throughout the history of financial development, network technology has played an increasingly important role in financial transformation. Bank 4.0 represents a new era for financial technology, evolving from the eras of the banking outlet, through e-banking to, most recently, mobile Internet. To prepare for Bank 4.0, banks have to embrace new technologies. They need to rebuild their business models accordingly and upgrade their infrastructure, in preparation for the "open banking" of the future. They will only achieve this by deploying intelligent networks that enable smart banking, anytime and anywhere. ▲



# Building an Intelligent Data Foundation for the Financial Industry

By Du Yumin, Huawei Storage Solution Architect

The biggest challenge the banking industry faces today is the growth of Internet finance. As intermediate traders, Internet financial services providers have taken many retail customers from traditional banks, and are also working to attract enterprise customers. In 2020, this process has been accelerated by the global outbreak of COVID-19, which has directly led to the exponential growth of contactless transactions, boosting the development of Internet finance. To tackle the challenges Internet finance brings and improve their ability to first retain and then gain customers, banks must make the most of their reputations for relative trustworthiness and reliability, and greatly improve the flexibility and convenience of their service rollouts at the same time.

## Adopting the Right Data Storage Architecture

To capitalize on the use of data, banks should deploy data storage architecture that best suits their size and their service development expectations. As the data foundation that supports the modernization of the banking industry, storage technology needs to meet three key requirements: cleanliness, toughness, and agility.

The banking service system essentially consists of seven

modules: security and supervision, channel access, channel integration, product catalog, core services, operation analysis, and development and testing. Meanwhile, the main service processing flow is divided into five phases: channel access, channel integration, product catalog, core services, and operation analysis. Security supervision and development and testing cover every phase.

As key service modules, channel integration, the product



***Based on a converged resource pool, Huawei provides financial customers with a simple, resilient, yet agile unified storage solution to build a solid, modern data foundation for financial services. With reliable products and outstanding services, Huawei's storage products and solutions serve 45 of the world's top 100 banks.***

catalog, and core services have high reliability requirements: Services must not be interrupted, and performance must be stable. Channel access, operation analysis, security supervision, and development and testing are common service modules that are susceptible to the impacts of regional political and economic environments, the actions of competitors, and service development. These modules demand elastic scaling, quick response, and agile services.

**Choosing the Right Storage Solutions for Key Service Modules**

All banks have the same requirements for service stability in key service modules: always-online services. A reliability of 99.999 percent for single devices simply isn't sufficient to meet their service stability requirements. All-flash — for stable performance — and 3-Data-Center (3DC) geo-redundancy, for multi-level Disaster Recovery (DR) protection, have become the basic configurations for mission-critical services. However, when selecting a specific solution, a bank should design the solution based on its own unique situation and environment. To give an example, one bank used a top vendor's products to implement 3DC geo-redundancy ring networking. The two primary sites worked in dual-active mode and replicated the data to the third site to form a ring network. However, the country's long-haul network was unstable, leading to numerous bit errors — and even fiber cuts at times. In networking modes such as this, the coupling between sites is too strong. Frequent switchovers caused by network instability mean that a large amount of data that is to be replicated accumulates in the memory of the main site. And when the memory is exhausted, faults occur. In regions

where the long-haul network is unstable, it's imperative to minimize the impact of the network's performance on the solution and therefore reduce coupling between sites.

In this example, the vendor should have deployed a tightly coupled active-active solution at the primary site, and it should have formed loosely coupled asynchronous replication relationships between the main site and other sites.

As it is for production and DR, services must also always remain online during configuration change, data migration, upgrade, and device maintenance. Multiple factors, including human factors and the external environment, also need to be taken into account. More than 20 percent of faults in a Data Center (DC) are caused by human error. Conducting repeated checks and drills before change operations, along with the formulation of recovery plans in advance, is essential in mitigating this type of fault.

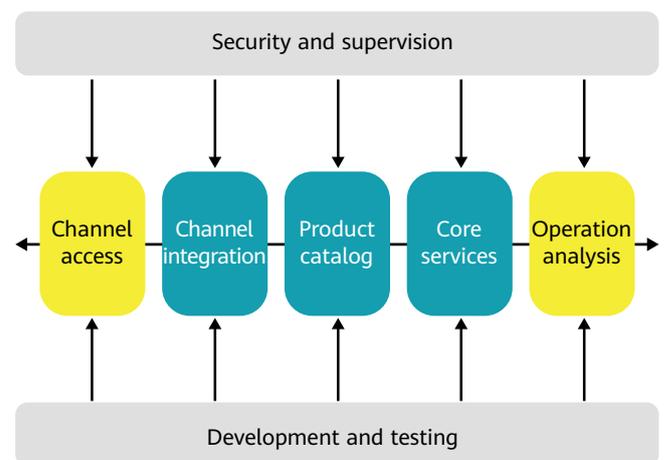


Figure 1: The seven modules of the banking service system



*Many banks choose Software-Defined Storage because it's easy to obtain, expand, and manage. Meanwhile, Hyper-Converged Infrastructure integrates computing, network, and storage resources, simplifying management and capacity expansion.*  
**>>**

The electromechanical environment of a DC can also become faulty. It's common for the fire sensor in a customer's equipment room to report an alarm by mistake. As a result, the high-pressure airflow of inert gases from the fire extinguisher can create a howling noise at the air outlet, which causes resonance and massive damage to Hard Disk Drives (HDDs). Compared with HDDs, Solid State Drives (SSDs) have better environmental adaptability in terms of temperature, electricity, and vibration, significantly reducing the probability of faults.

#### **Choosing the Right Storage Solutions for Common Service Modules**

When selecting storage solutions for common service modules, banks tend to focus on competition requirements. Many banks choose Software-Defined Storage (SDS) because it's easy to obtain, expand, and manage. Meanwhile, Hyper-Converged Infrastructure (HCI) integrates computing, network, and storage resources, simplifying management and capacity expansion.

Customers have multiple options here, including open-source SDS software and general-purpose servers; commercial SDS software provided by vendors and general-purpose servers; commercial distributed storage (software and hardware) products; commercial HCI software and general-purpose servers; or commercial HCI integrated software/hardware products. As no product is perfect in every aspect, customers should choose the solutions that best satisfy their needs.

With their own data storage Operations and Maintenance (O&M) teams and plenty of development and testing personnel, large

banks typically have strong Research and Development (R&D) capabilities and tend to choose open-source software and general-purpose servers. This is because the developers working at banks aren't professional storage experts and they have limited methods for optimizing and monitoring the underlying layers, limiting their ability to deliver optimal performance for every scenario. Instead, banks rely on the maturity of open-source software to monitor and handle faults. For example, at an exhibition in Europe, a top bank's R&D personnel asked Huawei staff how to optimize their system performance, complaining that many of their software apps can't identify the disk slot and that it's difficult to locate and replace faulty disks. Given such issues, banks should really focus on the development of new services and the improvement of service quality, and leave complicated tasks to vendors themselves.

HCI simplifies management and capacity expansion, and tightly couples various resources. During capacity expansion, computing or storage resources often become redundant. Determining the ratio of computing resources to storage resources in advance is therefore key to deploying HCI. Using HCI products integrated with applications is also feasible, and solution providers can more accurately calculate the optimal ratio of various resources.

#### **Huawei Storage: A Customized Solution for Banking Services**

Huawei is committed to providing the best storage products in the industry and customized solutions for banking services.

#### **High-End All-Flash Storage**



For mission-critical services, Huawei's OceanStor Dorado all-flash storage system is the only high-end storage system in the industry that can tolerate simultaneous failure of three SSDs.

At the controller layer, each engine supports four controllers. The system tolerates the failure of a single engine, and the collective failure of seven out of eight controllers across engines without causing service interruptions. For host links, the system supports single-link connection. Even if there is only one host link in the system, the controllers in the engine can still work properly and online upgrades can be implemented with no impact on host services. For SSDs, OceanStor Dorado supports RAID-TP (N + 3) protection, which can tolerate the failure of three SSDs at the same time. Here, data loss probability is 100 times lower than RAID 6 (N + 2) and 1,000

*To enable common services, Huawei provides OceanStor Pacific distributed storage, which supports block, file, object, and HDFS. The solution also supports protocol interworking between files, objects, and HDFS, facilitating data sharing and concurrent development of multiple applications.*

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times lower than RAID 5 (N + 1) and RAID 1 (N + N).

**Distributed Storage**

To enable common services, Huawei provides OceanStor Pacific distributed storage, which supports block, file, object, and Hadoop Distributed File System (HDFS). The solution also supports protocol interworking between files, objects, and HDFS, facilitating data sharing and concurrent development of multiple applications.

As well as supporting general-purpose x86 and ARM servers, OceanStor Pacific provides two types of hardware nodes for specific scenarios. For large-capacity scenarios, such as video and backup, OceanStor Pacific provides large-capacity nodes that support 120 disks in a compact 5U space — 20 percent higher than the next best-performing solution in the industry. It also provides ultra-high-performance nodes with a bandwidth of

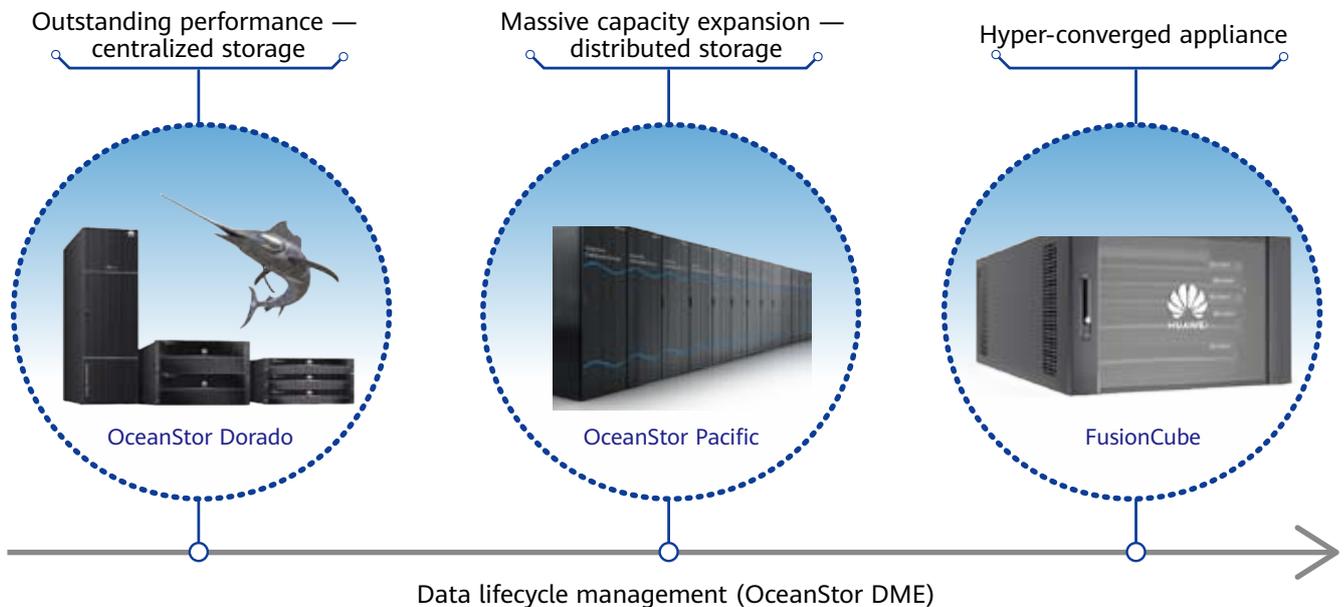


Figure 2: Huawei provides financial customers with a unified solution that is simple, tough, and agile



*Huawei's OceanStor DME software manages the lifecycle of data and devices in a cohesive, unified way: Administrators can automatically plan and configure resources in a single view. With a built-in automation engine and predictive algorithms, management and troubleshooting efficiency is improved three-fold. >>*

144 Gbit/s for High-Performance Computing (HPC) and Artificial Intelligence (AI) training, 40 percent higher than the industry's next best performing solution.

OceanStor Pacific also optimizes the container environment. It supports quick provisioning of massive containers, and 500 containers can be mounted per minute. The system also supports fast container migration. When a container is migrated to another server, path switchover and resource mapping can be completed within a second. And another benefit? Dedicated host clients are provided, improving performance by 30 percent.

#### **HCI**

In the HCI field, Huawei provides the FusionCube solution and works with Forms Syntron to create the Bank as a Service solution, offering microservice-based banking services, and forming an End-to-End (E2E) microservice system from applications and basic computing to network and storage resources. The solution simplifies management, improves resource usage, and minimizes the Time To Market (TTM) of new services and reduces capacity expansion time.

#### **Unified Lifecycle Management**

Huawei's OceanStor Data Management Engine (DME) software manages the lifecycle of data and devices in a cohesive, unified way: Administrators can automatically plan and configure resources in a single view. With a built-in automation engine and predictive algorithms, management and troubleshooting efficiency is improved three-fold.

Based on OceanStor DME and storage products, Huawei provides a unified intelligent converged resource pool solution, to pool

products, divide resources into different Service Level Agreement (SLA) layers, and allocate resources in a unified manner, following service requirements.

The OceanStor DME allows administrators to orchestrate and control data and data copies in multiple environments such as production, DR, and development and testing. Automatic, policy-based, or manual global snapshot, clone, and replication can be achieved in one view. The data of multiple versions is centrally managed, supporting Development and Operations (DevOps)-based agile production and development.

#### **Empowering Banks in the Intelligent Era**

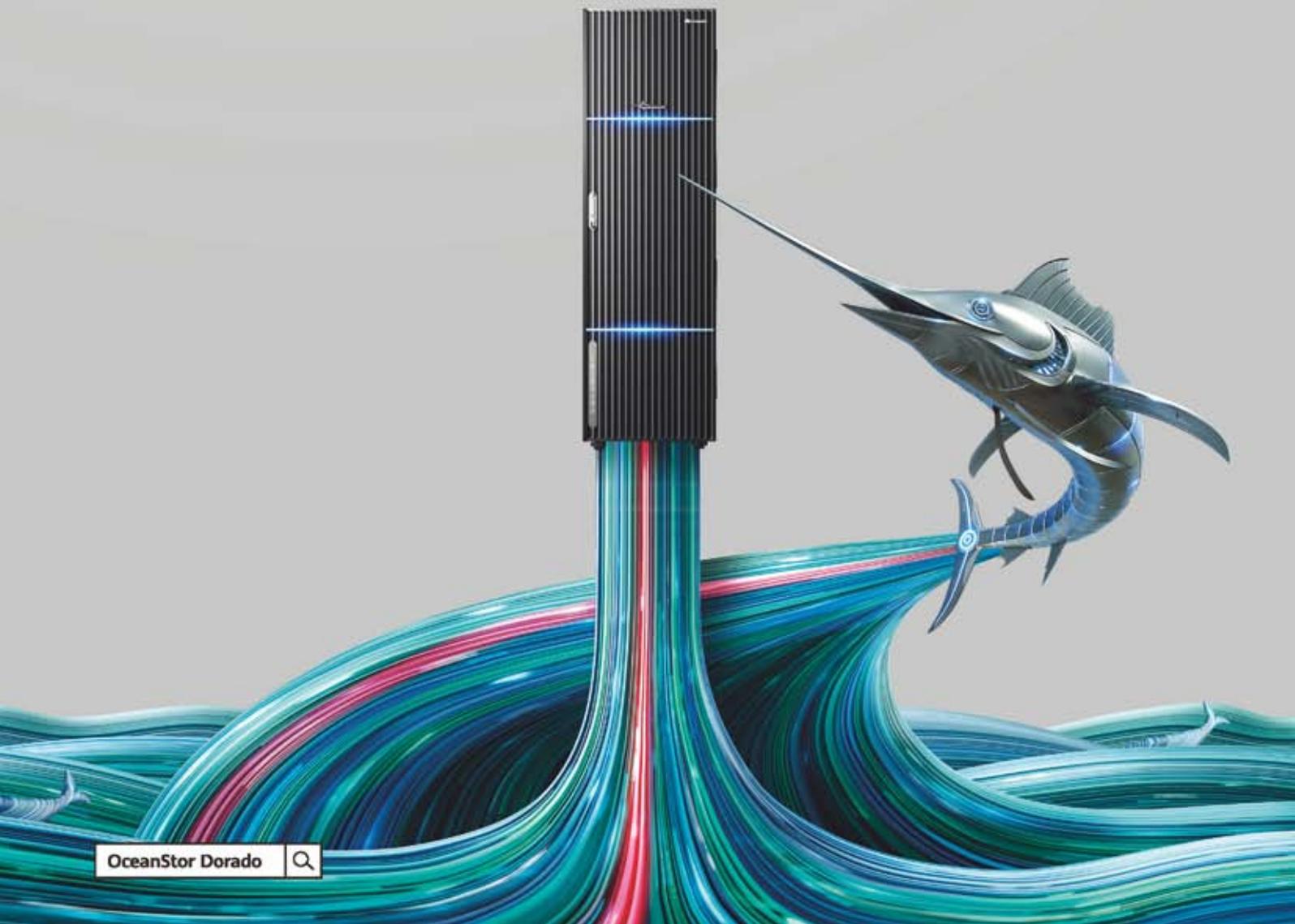
Based on the converged resource pool, Huawei combines the OceanStor DME, OceanStor Dorado, and OceanStor Pacific to provide financial customers with a unified solution that is simple, tough, and agile, building a solid data foundation for modern financial services. With reliable products and outstanding services, Huawei's storage products and solutions serve 45 of the world's top 100 banks.

In the next decade, the world will transform from a digital society to a smart society. As one of the foundations for socioeconomic development, finance will evolve from digital to smart finance. Huawei storage will continue to evolve toward cleanliness, toughness, and agility — maximizing the value and efficiency of each bit of data. In the intelligent era, Huawei will always strive to deliver the best products and solutions possible, to empower customers in the finance sector. ▲

POWERED BY 5G & AI

# Huawei **OceanStor Dorado** Transforms Enterprise Storage

Ever fast, ever solid, AI-powered all flash storage





# New Converged Data Platform Helps ICBC Execute ECOS Strategy

**E**stablished in 1984, the Industrial and Commercial Bank of China (ICBC) is a large, state-owned bank directly managed by China's Ministry of Finance. In 2018, ICBC ranked first in the *Top 1000 World Banks* list, compiled by the global financial intelligence publication *The Banker*. In 2019, ICBC ranked at No. 26 on the *Fortune Global 500* list — the highest position occupied by any bank. As China's largest commercial bank, ICBC prioritizes the development of Financial Technology (FinTech) and, given its focus on the domain, FinTech is now regarded as ICBC's core competitive strength and a key driver of its reform and innovation.

## The ECOS Smart Bank Strategy in the New Era

In November 2019, ICBC announced its "ECOS" smart bank ecosystem strategy, aiming to use cutting-edge FinTech to drive service transformation and development and build a smart bank for the digital era.

**"E" refers to "Enterprise-level":** ICBC aims to create a new system for product integration, information-sharing, process linkage, and channel collaboration from a corporate point of view, to deliver a consistently high-quality "One ICBC" experience to customers.

**"C" refers to "Customer-centered,"** embodying ICBC's "customer first" service principle and its goal of "becoming a bank at customers' fingertips as well as in their hearts."

**The "O" stands for "Open,"** representing both "openness and convergence": ICBC is embracing new life- and scenario-based financial service development trends. With its own e-banking, e-connection, and e-shopping platforms as the cornerstones, ICBC aims to build an open and cooperative financial ecosystem that benefits all parties based on Application Programming Interfaces (APIs) and financial

*Huawei and ICBC have cooperated over the past five years to build and operate a massive cloud data lake. During that period, Huawei has helped ICBC build a solid and efficient data foundation to execute its “ECOS” strategy. Because of this successful cooperation, hundreds of data applications now run efficiently and accurately on a big data service cloud platform.*

ecosystem cloud platforms.

Finally, “S” means “Smart,” indicating that ICBC is making comprehensive deployments in cutting-edge technologies such as Artificial Intelligence (AI), blockchain, cloud computing, big data, and Internet of Things (IoT) — referred to as “ABCDI” — and has developed a series of core technology platforms to provide the strongest “brains” for banks in terms of customer service, precision marketing, risk control, and decision-making management, ultimately empowering the bank’s transformation and innovation.

Based on its ECOS strategy, ICBC built an open and converged cross-industry ecosystem. The strategy has helped ICBC become China’s largest comprehensive financial service provider, allowing seamless integration of financial products and services — including payment, financing, wealth management, and investment — into customers’ daily lives and everyday consumption habits as well as into enterprise scenarios such as education, healthcare, mobility, and government services. Because of these developments, ICBC’s financial services are now as convenient and accessible as water and electricity.

The bank also developed an “intelligence+” innovation model by strengthening digital and intelligent applications to make services, products, risk control, and operations smart, meeting the new expectations and requirements people have for financial services.

To support flash sales scenarios — a prime example of increased expectations for financial services — ICBC developed

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#### About ICBC

Founded on January 1, 1984, ICBC is a large state-owned bank directly managed by China’s Ministry of Finance. In 2018, ICBC ranked No. 1 on the *Top 1000 World Banks* list compiled by global financial intelligence publication *The Banker*. In 2019, ICBC ranked No. 26 on the *Fortune Global 500* list — the highest position of any bank.

high adaptability and flexible capabilities. Its support for high-frequency and complex services has been enhanced through IT architecture transformation and application of new FinTech. These capabilities were proven when ICBC supported a transaction rate that increased five-fold during the peak hours of the “Double 11” shopping frenzy on November 11, 2018. And in 2019, when China released commemorative coins to mark the 70<sup>th</sup> anniversary of the founding of the People’s Republic of China, within five minutes of the launch, ICBC apps were able to support more than 30 million reservations.

ICBC owes such successes to the dual-core IT architecture it built, becoming the first bank in the industry to develop core banking service processing capabilities based on a distributed cloud platform. More than 90 percent of system functions run on the open platform, greatly improving system transaction performance and ensuring fast and stable system operations.

The bank also built a range of industry-leading enterprise-level FinTech platforms, covering AI, intelligent biometric identification, IoT services, and blockchain technologies, to promote the integration of new technologies and services.

ICBC has developed leading enterprise-level technical and service application capabilities, and the platforms have empowered financial services by improving both service quality and efficiency.

With component-based innovation capabilities featuring flexible combinations and rapid Research and Development (R&D), ICBC is highly agile and can quickly respond to new market and customer requirements.

### Building a Next Generation Converged Data Platform Together With Huawei

Smart banks require a solid, intelligent, efficient, and open data foundation. In 2015, ICBC and Huawei established a joint innovation team to create a converged data platform. Initially, the team chose an Electronic Data Interchange (EDI) application on the existing appliance platform, running the simplest 100 operations on Huawei's GaussDB Online Analytical Processing (OLAP) for test purposes. After running these operations successfully, the team then repeated the process — this time choosing the most demanding and complex operations to more fully test OLAP's capabilities and improve its performance. Step by step, the team completed EDI full program migration, as well as the migration of all subsets of the data warehouse, and the subsequent migration of data warehouse appliance products. In the process, ICBC and Huawei developed an industry-leading open and converged data platform.

#### First Appliance Data Warehouse Platform Migration in China

On June 30, 2019, ICBC's enterprise-class data warehouse based on an appliance



platform was replaced with a big data service cloud, based on Huawei's converged data platform. This successful running of converged data products indicated that ICBC was taking the lead in building the digital world (a world in which ICBC will play a leading role, serving the real economy, and providing more inclusive financial services). At the same time, the success demonstrated that Huawei's converged data warehouse platform, with FusionInsight and GaussDB at its core, has become a world-class leading data platform.

ICBC's big data service cloud is built on top of Huawei's open, distributed infrastructure. With thousands of clusters and a storage capacity of nearly 100 Petabytes (PB), the cloud supports over 100,000 Transactions Per Second (TPS), and integrates and manages structured and unstructured data. It provides real-time, quasi-real-time, minute-level, and hour-level computing capabilities, and is a new generation of open big data ecosystems, jointly built by Huawei and ICBC's big data team for the Internet of Everything (IoE) era. It is also a converged data platform with the largest scale, most complete data, strongest capabilities, and most comprehensive functions in the financial industry. ICBC has 125 applications, 26 branches, and more than 1,000 scenarios that provide cloud-based services.

#### Cloud-Based Data Lake Enables More Efficient Services

In the past five years, ICBC and Huawei have cooperated to process more than 50,000 operations, 80 data marts, 100,000 data models, and petabytes of data, as well as completing the construction, migration,



*In the past five years, ICBC and Huawei have cooperated to process more than 50,000 operations, 80 data marts, 100,000 data models, and petabytes of data, as well as completing the construction, migration, and operation of a massive cloud data lake. >>*

and operation of a massive cloud data lake. Hundreds of data applications — including customer management, marketing, risk management, real-time risk control, performance management, and self-service data analysis — now run effectively and efficiently on the big data service cloud platform. This is an impressive feat because, for this to happen, each line of code must run correctly, each piece of data must be accurate, each system must be connected, and each operation requires excellent performance.

The next generation converged data warehouse eliminates the disadvantages of the original data warehouse appliance, such as a closed architecture, insufficient data processing capabilities, high costs, long periods of downtime during capacity expansion, low batch-processing efficiency, and the inability to support cross-generation product upgrades. The converged data warehouse integrates unstructured and stream data and offers high scalability. And the practical benefits of the solution are clear. For example, after completely replacing Vendor T's data warehouse appliance, the capacity capability increased ten-fold, query performance improved six-fold, batch-processing time was reduced by 40 percent, and operating costs were slashed by approximately 90 percent. The solution is relatively future-proofed, too, as it supports smooth evolution on the cloud.

### **Enterprise-Level Data Foundation in the Intelligent Era**

As digitization has spread rapidly across industries in the era of big data, it has become increasingly difficult for traditional

data warehouses to keep up, given the explosive growth of data volumes. To cope with the trend, enterprises are now actively seeking out supplementary or alternative solutions for data warehouses.

Huawei's converged intelligent data platforms can meet the requirements of multi-source, heterogeneous, and diverse data analysis in the digital era. They include key components — such as intelligent data connections, intelligent data storage, intelligent data processing, and intelligent data enablement platforms — that implement full-lifecycle data management and processing. The logical data warehouse solution based on Huawei's converged data platform provides unified storage, a unified directory, and data virtualization capabilities for multi-source, remote, and heterogeneous data, implementing cross-source, cross-domain, and cross-cloud data management and analysis, and connecting data silos and streamlining the global data supply chain. The solution enhances the ability of data warehouses to adapt to emerging new services, helping enterprises build leading data infrastructure, embrace industry digitization, and maximize data value.

Looking to the future, ICBC is determined to enhance the application of its innovative financial technologies, and Huawei will continue to support ICBC's data platform innovations in Enterprise Intelligence (EI), AI, and the data middle platform, as well as improve full-stack cloud-based service capabilities based on the HUAWEI CLOUD Stack (HCS) 8.0. The two companies will continue to collaborate, as they aim to transform digital finance. ▲



# Bank of China's Cloud Platform Boosts Development of Smart Financial Services

## "1234" Digital Development

Founded in 1912, Bank of China (BOC) is a large state-owned commercial bank managed by China's Ministry of Finance that has become one of world's most important banks. As one of the four major banks in China, it's also one of 29 "Systemically Important Financial Institutions in the world." With a Tier-1 capital of US\$230 billion, BOC ranked 44<sup>th</sup> on the *Fortune Global 500* list in 2019, and fourth on the *Top 1000 World Banks* list in 2018 by the global financial intelligence publication *The Banker*.

In 2018, BOC devised a new development strategy, which will be led by technology and driven by innovation; BOC will transform to build a world-class bank in the new era, with technology-driven digital development at its core. This

strategy marked the start of a new chapter for BOC's digital transformation.

BOC's digital transformation will be based on its "1234" guideline. This means it will center on *one* "digital transformation" strategy; will build *two* architectures (enterprise-level service and technical); will create *three* digital platforms: cloud computing, big data, and AI platforms; and focus on *four* fields: service innovation and development, business and technology integration, technical capabilities, and transformation of scientific and technological mechanisms.

## Cloud Platform: Eliminates the Traditional Centralized Architecture Bottleneck

The adoption of centralized architectures by banks in China

*Bank of China has completed the largest-scale deployment of a distributed cloud platform in the finance industry. Its cloud platform greatly outperforms traditional data centers by improving hardware resource usage by over 2.5 times and shortening the application rollout time by more than five times through elastic resource scaling and full-process simplification.*

dates back to the 1960s. In the early stage of informatization, BOC — like other banks in China — opted for centralized development, to implement intensive management and advanced operations. After four decades, BOC has established a complete centralized architecture information system, which is quite mature in terms of its technical system, technical services, and ecosystem construction.

With the rapid development of Internet finance and the rising national requirements for independent core capabilities, the centralized architecture no longer meets the application requirements of emerging services such as the Internet services, data analysis, and channel access.

**Risk concentration:** With a centralized architecture, if an exception occurs, the entire system may fail, causing a global system fault.

**Difficult capacity expansion:** With a centralized architecture, the overall system capability can be increased only by improving the device configuration. The capacity expansion cost is high, and the operations are inconvenient. Meanwhile, the capacity expansion capability of the hardware is limited, which is insufficient given the rapid evolution of products and technologies.

**High costs:** Most software and hardware devices of the centralized architecture are provided by foreign vendors that monopolize the market. In these circumstances, banks have a weak price bargaining position and inevitably end up paying high prices for the equipment. Compounding the problem, they also can't control the key technologies involved.

In this context, BOC decided to give equal priority to

centralized and distributed architectures. In 2017, BOC released its construction plan for a distributed cloud platform, planning to build ultra-large cloud data centers in Xi'an, Hefei, and Inner Mongolia.

### Construction of a Distributed Cloud Platform

An ideal cloud platform must be devised before platform construction. The key lies in the services and the requirements of the frontline Operations and Maintenance (O&M) team. These requirements include unified back-end management of computing, storage, and network resource pools to implement flexible resource scheduling.

Meanwhile, the resource pool scale must be able to meet large-scale application deployment needs. The cloud platform should also support cross-DC management and dual-active deployment. Automated installation and one-click application deployment are also priorities, as well as flexible resource

#### About Bank of China

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Bank of China's cloud platform boosts development of smart financial services

2.5+ times  
↑

improved hardware resource usage

5+ times  
↓

shorter application rollout time

1 week  
↓

less to release the service  
(down from several weeks, or even months)

scaling of application systems based on service loads. Ideally, a cloud platform will lead to few changes to the existing O&M system and allow for full process standardization.

The solution design must also take into account the reliability and availability requirements of financial services, as well as data security and regulatory compliance requirements.

After BOC's design prerequisites and service requirements were specified, the design solution was created. BOC's cloud platform in Xi'an consists of multiple OpenStack zones, including the production intranet zone, production Demilitarized Zone (DMZ), service assurance intranet zone, service assurance DMZ, and the O&M zone. The OpenStack zones carry different types of services with different requirements.

**Production zone:** Consists of the intranet zone and DMZ. The intranet zone is the most important of all zones, which is used for core service computing and core data storage. This zone doesn't directly communicate with external data to ensure system stability and data confidentiality. Meanwhile, the production DMZ is used for external information communication and serves as the buffer zone between the production intranet and external networks.

**Service assurance zone:** Consists of the intranet zone and DMZ. The two zones serve the same functions as the production zone, but the service assurance zone is responsible for application development, User Acceptance Test (UAT), and pressure test.

With this architecture, the production zone and service assurance zone are physically

isolated, to ensure data security and that the development environment is the same as the actual application environment. Within the different zones, the logical isolation mode is used to ensure information exchange and fast application deployment. An independent O&M zone is also established, to effectively monitor the entire system and properly schedule resources.

The construction of BOC's Xi'an cloud platform highlighted the following points:

**High Availability (HA):** The cloud platform HA is classified into regional and local. For regional HA, the cloud platform allows applications to be deployed in two remote Data Centers (DCs) at the same time and supports unidirectional and bidirectional data replication between the two DCs, implementing dual-active deployment of distributed applications in the two DCs. The equipment room in Hefei and the two equipment rooms in Inner Mongolia will implement mutual disaster recovery and backup to ensure high service reliability. Local HA is realized by deploying multiple Availability Zones (AZs) in an OpenStack region. When one AZ is faulty, the others take over to ensure service continuity and VM availability.

**Large scale:** To achieve large-scale deployment, the cloud platform must support large-scale deployment of Physical Machines (PMs) and Virtual Machines (VMs), meeting the deployment requirements of high-concurrency and high-performance services. The cloud platform supports flexible scheduling of physical resources in an OpenStack region to meet resource requirements during peak hours. The cloud



*The cloud platform of BOC has deployed thousands of physical nodes and provisioned nearly 10,000 VMs, the largest deployment of the distributed cloud platform in the financial industry. BOC is also the first enterprise in the banking industry to deploy production services on the distributed cloud platform. >>*

platform supports smooth capacity expansion of resource pools, allowing for new service rollout and migration of traditional services in the future. Finally, the cloud platform supports the scheduling of drill resource pools to cope with emergencies that require large-scale resource expansion.

**Standardization:** Standardization is a prerequisite for automated O&M. The standardization of the cloud platform goes through the entire process of construction, including hardware configuration standardization; software architecture standardization; hardware resource pool construction, capacity expansion, return standardization; VM resource application, approval, provisioning standardization; and end user-oriented service catalog standardization. In the standard mode, the cloud platform construction, management, O&M, and application are performed based on the best practices and specifications, greatly reducing management difficulties and improving O&M efficiency.

**Servitization:** Financial cloud users are separated from cloud builders and maintainers, providing self-service for application O&M personnel and implementing one-click deployment of application systems. O&M personnel can orchestrate each step in the process through dragging, which makes the entire process clearer and greatly improves the orchestration efficiency. The cloud platform is more automated and convenient, so that O&M personnel can

focus on cloud construction and O&M instead of application rollout.

### Smart Finance Starts from the Cloud Platform

The cloud platform of BOC has deployed thousands of physical nodes and provisioned nearly 10,000 VMs, the largest deployment of the distributed cloud platform in the financial industry. BOC is also the first enterprise in the banking industry to deploy production services on the distributed cloud platform.

Compared with traditional data centers, the cloud platform improves hardware resource usage by over 2.5 times through elastic resource scaling and simplified processes, and shortens the application rollout time more than five-fold. In the past, it took several weeks, or even months, to prepare for application rollout. Now, it takes only about a week to release the service on the cloud platform.

In 2019, BOC began construction of the first and second phases of the Hefei cloud platform and the cloud platform in Inner Mongolia. When completed, BOC will have a distributed DC architecture based in Xi'an, Hefei, and Inner Mongolia. As the scale of the cloud platform expands, a wide range of financial services, such as Internet services and channel transaction services, will go online. As BOC develops and evolves its distributed cloud platform, Huawei will provide support by continually upgrading HUAWEI CLOUD. ▲

# Chinese Banking Giant CCB Builds the First '5G+ Intelligent Bank' Offering New Marketing Services

By Shang Jiantao, Data Communication Product Line, Huawei Technologies Co., Ltd.

When was the last time you visited your bank? When was the last time you carried out a transaction at the bank counter? Internet finance is now at work in every aspect of our lives. Gone are the days of always needing to physically visit a bank branch, where you'd have to queue up to be served at a bank counter. Now, more and more people use mobile banking to handle their transactions, including money transfers, loan, wealth management, tax payments, and automobile financial services. And this can all be done with just a few simple clicks. In this changing environment, traditional bank branches face unprecedented challenges in their operating mode, and are at risk of becoming obsolete.



***CCB was eager to introduce Huawei's SD-WAN and 5G technologies into WAN construction for 5G+ intelligent banks. The combination of 5G and SD-WAN leads the development of WANs in the banking sector, and quickly extends the range of CCB's inclusive financial services while enabling fast rollout of 5G+ intelligent banks.***

What direction should traditional bank branches go in as they look to evolve? This a key decision for industry players to consider.

### **CCB Launches '5G+ Intelligent Bank' to Unleash New Marketing Services**

"When stepping into this branch, I'm really impressed by how high-tech every corner of it is. Flashy robots, personalized customer journey display, remote expert service over the Smart Teller Machine (STM), eye-catching Financial Capsule, and fantastic automobile financial services experience... You name it. It is totally different from a traditional over-the-counter branch."

"Once entering the Financial Capsule, I'm immersed in a future financial service space. The clever robot recommends the latest wealth management products and intuitively presents the revenue. I really love it."

These are a few observations about the "5G+ intelligent" Beijing's Qinquayuan branch of China Construction Bank (CCB). Driven by its need for next-generation system and Financial Technology (FinTech) strategy, CCB applies innovative technologies such as financial cloud, 5G, Internet of Things (IoT), and Artificial Intelligence (AI) to accelerate the transformation from traditional over-the-counter branches that focus on transaction settlement to smart branches that center on marketing and services, as well as launching the first-of-its-kind future-proof 5G+ intelligent bank.

CCB's 5G+ intelligent bank innovatively launches application scenarios such as Financial Capsule, STM, robot,

and home bank, and provides 327 functions for common financial services, reshaping the service process from the perspective of the entire customer journey. This intelligent bank integrates online and offline mobile banking services, WeChat banking, and branches, and offers multiple fun interactive games. The end result is significantly improved transaction handling efficiency, minimized queuing time, and more fun and interesting financial service transactions. These features make the 5G+ intelligent bank an ideal marketing and service center.

But none of this is possible without the WAN infrastructure. While the 5G+ intelligent bank continuously optimizes the financial services experience, it also drives the exponential growth in traffic. As such, bank branches require ever-demanding real-time data transmission performance and high bandwidth. MSTP private lines commonly used by traditional branches are seemingly mature and stable, but offer rates of only 2 to 4 Mbit/s bandwidth. This falls far short of the ultra-large bandwidth required by the wide range of smart applications in the 5G+ intelligent bank. Compounding this problem, to cope with ever-changing business environments, branches have more stringent requirements on mobility and provisioning speed. With more than 10,000 branches across the globe, CCB urgently needs to find a new way to improve the Operations and Maintenance (O&M) and management efficiency on such a large number of complex WANs.

### **5G + SD-WAN: Building a "Bridge" for Smart Connection of Bank Branches**

CCB is a pioneer in FinTech innovation, proactively exploring

The combination of Huawei's SD-WAN and 5G enable fast rollout of CCB's 5G+ intelligent banks

100-fold

bandwidth increase for smart branches

Unified

management of LANs, WANs, and security networks

All-round

security protection from the device, link, and policy perspectives

disruptive connection technologies, so CCB was eager to introduce Huawei's SD-WAN and 5G technologies into WAN construction for 5G+ intelligent banks. The 5G network functions as the underlay network, providing the network infrastructure with ultra-high bandwidth and ultra-low latency for intelligent banks. On top of this 5G network and the legacy MSTP private lines, SD-WAN is used to build an overlay network. In this way, high-speed interconnection channels can be quickly built between CCB's branches and the financial cloud. The cloud-based iMaster NCE, a network management and control system, implements automated configuration for complex branches. The combination of 5G and SD-WAN leads the development of WANs in the banking sector, and quickly extends the range of CCB's inclusive financial services while enabling fast rollout of 5G+ intelligent banks.

### **Cloud and 5G: 100x Bandwidth, Millisecond-Level Latency, and Plug-and-Play**

5G features high bandwidth and low latency, as well as being cabling-free. Such characteristics make the 5G network ideal for the banking sector. By deploying Huawei's NetEngine AR enterprise routers, CCB builds dual service channels (5G and MSTP private lines), achieving 100-fold bandwidth increase for smart branches. Specifically, the tested rate of 5G+ intelligent banks can reach the Gbps level, fully supporting the exponential growth of data traffic at intelligent banks. And with facial recognition, intelligent voice, augmented reality, and virtual reality technologies, customers can quickly handle financial transactions such as banking services, consultation and reservation, and 5G Wi-Fi surfing, as well as enjoying personalized and

dedicated services in various scenarios. In this way, 5G+ intelligent banks can provide full-journey, immersive, and personalized financial services experience.

Other features of 5G are fast deployment and high mobility. This means that intelligent banks can be quickly rolled out without waiting for carriers to install or deploy private lines. It also facilitates quick provisioning of smart branches and setup of demonstrative mobility services; for example, connecting community banks and call centers through 5G/LTE and Internet, or deploying temporary financial service branches at large event venues to provide onsite financial service assurance.

### **Application-Based Intelligent Traffic Steering, Ensuring Optimal Financial Services Experience**

SD-WAN builds an End-to-End (E2E) overlay network to logically combine intermediate network nodes, and 5G implements one-hop access to the cloud for intelligent banks, greatly simplifying the network topology. Smart banks often have dozens of applications. These applications can be monitored and identified in real-time using SD-WAN, which enables access to the cloud through 5G and MSTP private lines. SD-WAN also transmits traffic of key financial applications over the optimal path selected by means of key application identification, dynamic path optimization, traffic steering based on the Service Level Agreement (SLA), application priority, and bandwidth usage. This ensures the optimal experience for key applications.

### **Intelligent O&M and Unified Cloud Management**

SD-WAN orchestrates and schedules network-

wide link and bandwidth resources based on applications. It also applies intelligent application identification to identify a broad range of applications such as key financial applications, IoT applications, and Internet applications in real-time, and presents the real-time key indicators, including the status and bandwidth usage of applications, links, sites, and devices. This facilitates capacity expansion, link optimization, and site adjustment, and optimizes network investment and planning. What's more, SD-WAN provides the centralized network O&M and management tools, as well as comprehensive network policy configuration tools to implement unified management of LANs, WANs, and security networks. It also automates the entire process ranging from network provisioning, service deployment, and fault locating, all the way down to routine inspection. In addition, the Geographic Information System (GIS)-based network topology information and multi-dimensional visualized reports based on links, applications, users, sites, and devices help quickly locate network faults while optimizing network policies, enabling financial services to be carried on a simple and reliable network.

CCB has a unified intelligent O&M platform that features strong technical support and easy integration capabilities. Huawei's SD-WAN Solution can easily integrate with this platform by using open northbound RESTful APIs provided by iMaster NCE. This integration facilitates E2E resource association and full-process automation. To be more specific, based on CCB's distinctive financial services, the intelligent O&M platform provides a unified self-service User Interface (UI), which provides complete user-oriented service

directory, resource application, process approval, and other functions. Furthermore, the intelligent O&M platform delivers SD-WAN network configuration and policies to NetEngine AR routers, achieving association between underlying network resources and financial services requirements. This helps build efficient and flexible WANs that suit financial services and drive the transformation of FinTech enterprises.

#### **High Controllability and Security, Ensuring Financial Services Security**

Network security is crucial to the development of FinTech. Based on Huawei's brand-new NetEngine AR routers and iMaster NCE, CCB can implement all-round security protection from the device, link, and policy perspectives. On the 5G-powered wireless virtual private network of CCB, Huawei SD-WAN Solution orchestrates security service chains based on security policies to implement E2E encrypted transmission of service data, guaranteeing the security of each transaction.

#### **5G+ Intelligent Bank: Keep Innovating**

Driven by the pursuit of better financial services experience and quality, CCB has never ceased in its FinTech innovation. As 5G+ intelligent banks are sweeping across China, the combination of 5G and SD-WAN will offer more diversified flexible access options for intelligent banks, and better meet security and flexibility requirements of financial services. Because of these advantages, 5G+ intelligent banks will extend the scope of inclusive financial services and transform into all-scenario financial services experience centers that offer customers an improved banking experience. ▲



*As CCB's 5G+ intelligent banks are sweeping across China, the combination of 5G and SD-WAN will offer more diversified flexible access options for intelligent banks, and better meet security and flexibility requirements of financial services. >>*

# CMB: Promoting Network Transformation, Creating the Future of Financial AI

By Li Yunlong, Manager of Data Center Network Division, Information Technology Department, China Merchants Bank

China Merchants Bank (CMB) was founded in 1987 in Shenzhen, the city at the forefront of the reform and opening-up of China. It is the first share-holding commercial bank to be wholly owned by corporate legal entities in China. CMB is innovative in providing thoughtful services to customers. For example, CMB was the first Chinese bank to hold umbrellas for customers coming in and out of the bank on rainy days, introduce queue management systems, and offer milk



***Huawei's CloudFabric data center network provides powerful support for CMB in digital transformation and digital operation reconstruction. Huawei will continue to partner with CMB to promote Retail Finance 3.0 and shape the future of financial AI.***

to customers. Over the past 30 years, CMB has developed rapidly and was ranked No. 188 in the *Fortune Global 500* list in 2019. Among the *Top 1000 World Banks* list in 2018 released by *The Banker*, an authoritative financial magazine in the UK, it was ranked No. 20 by capital, No. 12 by profit, No. 7 by Return On Equity (ROE), and No. 3 by revenue. CMB was ranked No. 1 by business performance indicators among all banks in China.

### **Evolving from the Card Era to the App Era and Promoting Retail Finance 3.0**

The above achievements are due to CMB's continuous strategic transformation over the years. In terms of digital transformation, CMB specified its strategic direction and positioning of "Light Bank" and "One Body with Two Wings," with retail finance as the main body and corporate finance and interbank finance as two wings, in 2014. In 2015, CMB outlined its mobile-first strategy and developed two apps, Mobile Banking and Handheld Life, taking CMB into the app era. In 2017, CMB proposed to use financial technology as the driving force for future transformation. This allowed CMB to change from a "customer thinking" to "user thinking" strategy. It also enabled the company to change from a "card business" to "app operation" direction, and from a "transaction thinking" to a "user journey thinking" approach. The company has been dedicated to promoting Retail Finance 3.0 and transforming from operating static transaction products to building a dynamic service ecosystem.

The main operation field of CMB has changed from branches to apps. The two apps, Mobile Banking and

Handheld Life, have become the most important carriers for connecting customers to CMB and the most important platform for CMB to provide retail services. By the end of 2019, the number of Monthly Active Users (MAU) of the two apps reached 102 million. In 2018, CMB proposed to use the MAU as the "North Star Metric" to guide retail financial transformation. In the Retail Finance 3.0 era, CMB will continue executing its mobile-first strategy and to promote digital transformation of retail finance. The company will do this by building platforms, extending application scenarios, and traffic operations. It will also build a service system covering all products, channels, and customer groups to provide customers with the optimal experience.

### **Three Challenges and Transformations of Networks to Reconstruct Digital Operation**

The financial technology transformation centered on app operation requires transformation and planning in different

#### **About CMB**

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areas. These include customer service, operation mode, and organization architecture using financial technologies. It also requires a vast transformation and reconstruction to IT infrastructure, which brings severe challenges to networks.

Firstly, in the decision-making system, real-time and intelligent requirements of services make big data analysis increasingly popular in the service chain. Prompt big data analysis is important. The Artificial Intelligence (AI) is related to both IT computing power and network performance. High throughput, low latency, and zero packet loss are basic requirements for networks. Traditional networks limit the improvement of AI training efficiency. Secondly, financial services require agility. However, with traditional operations, weekly delivery and daily network policy provisioning are far from agile. Thirdly,

*O&M support system needs to ensure service continuity and enhance stability and visualization. The system also needs to provide an insight into the network and its data as it is interconnected, scaled-up, and made more complex due to increased traffic. >>*

the O&M support system needs to ensure service continuity and enhance stability and visualization. The system also needs to provide an insight into the network and its data as it is interconnected, scaled-up, and made more complex due to increased traffic.

There are three main aspects that represent CMB's digital transformation practices.

**Reconstructing the Decision-making System and Using Intelligent Lossless Ethernet to Achieve Efficient Running of AI Data Centers**

Service intelligence can't be achieved without big data. Today's data center can better realize its potential than ever before. The data center contains service, customer, and O&M data, which is increasing explosively. What matters is how to use this data, and CMB has now diversified services,

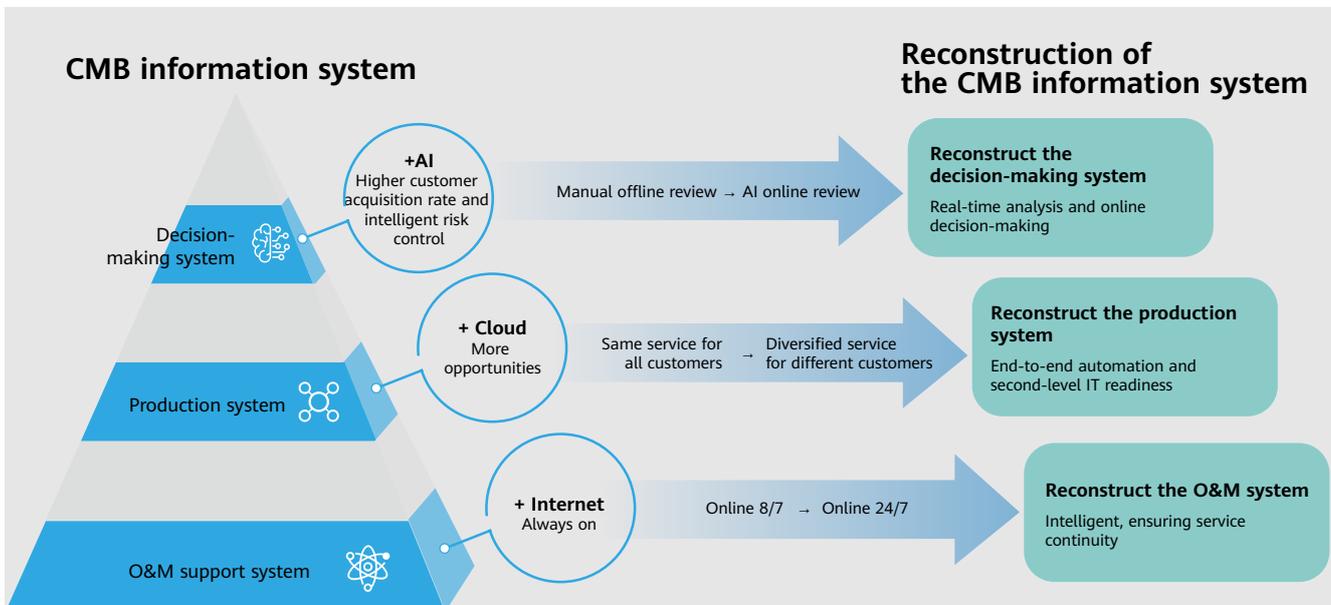


Figure 1: Reconstruction in three layers of CMB's information system



*From the beginning of 2017 to October 2018, the growth of CMB's computing and network resources exceeded its inventory for the previous 10 years. The number of app visits has reached 450 million per day with the peak number reaching up to 15,000 per second. >>*

including intelligent customer service, smart marketing, and Machine Gene Investment. The data is continuously creating value for CMB. Meanwhile, real-time data analysis is gradually being adopted in CMB's services. Prompt big data analysis is becoming increasingly important. For networks, big data analysis requires not only high bandwidth, but also low latency and zero packet loss capability.

CMB has implemented data analysis in the branch cloud, which is an innovative pilot of CMB's cloud computing strategy, with the company adopting a deployment architecture with separated computing and storage. The IT system department of CMB has introduced the Remote Direct Memory Access (RDMA) to improve the overall network throughput and reduce CPU consumption. This provides users with the same experience as accessing local disks. RDMA is a technology that is extremely sensitive to latency and packet loss, and according to the test data of CMB, approximately one thousandth of packet loss results in the loss of half of the network throughput. Therefore, zero packet loss is required on networks.

However, the Ethernet is a less reliable network in a traditional data center network. Fortunately, Huawei CloudFabric data center network provides CMB with an intelligent lossless Ethernet solution. With this solution, CMB has achieved high throughput, zero packet loss, and low latency by using iLossless, an intelligent lossless switching algorithm. According to the AI training test, the throughput of a compute node accessing a storage node in a 25GE NIC reaches 2.8 GByte/s. The throughput of the entire

storage cluster is increased by at least 20 percent compared with that of a traditional network. This is equivalent to four to five iterations per second. Next, to propel the AI strategy, CMB is planning to introduce the intelligent lossless Ethernet to the Graphics Processing Unit (GPU) cluster with 300 NICs.

#### **Reconstructing the Production System and Building Full-Process Automation Through ADN Joint Innovation**

The IT infrastructure of CMB increases exponentially with the digital transformation of financial services and the advancement of technology strategies. These include cloud computing, big data, and AI. From the beginning of 2017 to October 2018, the growth of CMB's computing and network resources exceeded its inventory for the previous 10 years. The number of app visits has reached 450 million per day with the peak number reaching up to 15,000 per second.

The rapid growth poses significant challenges to the construction of infrastructure, with the service agility requiring frequent network changes. How can we build a full-process and automatic chain to efficiently implement service intents in network configurations? This is one of the biggest challenges that CMB has faced, and to find solutions to this, CMB and Huawei have made joint innovations and explorations.

In 2017, CMB deployed Huawei's CloudFabric data center network in an availability zone with 2,000 nodes in the newly built Xili cloud data center. If a traditional deployment mode was used, it would take at least two weeks to complete the delivery, connection, and verification



The CMB cloud data center introduced Huawei's iMaster NCE FabricInsight network intelligent analyzer to implement automatic fault identification. It also introduced the product for intelligent fault locating, and potential risk prediction based on big data and AI algorithms. >>

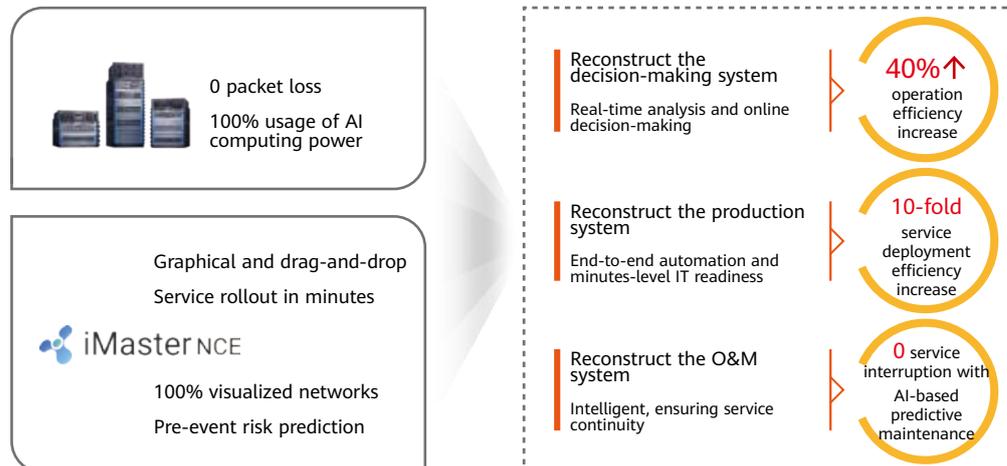


Figure 2: Huawei's CloudFabric builds the best data center network for financial digital transformation

of the basic network of the same scale. However, using Huawei's iMaster NCE and the Zero-Touch-Provisioning (ZTP) function, CMB implements automatic delivery of overlay configurations. Therefore, service configurations can be delivered in minutes, shortening the delivery of basic networks to three days. Overall, this greatly reduces the pressure in the resource delivery phase.

Although network resources are efficiently delivered, there will still be endless service rollout and auto scaling, and a huge gap exists between the service intent and the final network configuration. For example, network engineers often face the service requirement scenario where service growth is expected to exceed 50 percent. A network engineer may be unable to handle such service requirements, because 50 server nodes need to be added, 500 IP addresses need to be allocated, or even 5,000 network policies to be enabled. Although automation is implemented in parts of the work for the network engineers, full-process automation isn't achieved. It's estimated that capacity expansion of such scale takes

approximately one month, with IT engineers facing high communication and rework costs caused by incorrect or missing configurations.

To address this pain point, CMB and Huawei launched a joint innovation project to discover breakthroughs and solutions and to achieve success in the Autonomous Driving Network (ADN). The project aims to identify business intents as network behavior and form a complete closed-loop of policy, verification, delivery, and verification. This can be implemented so that the overall network delivery time, and operation and capacity expansion time can be shortened to just days.

**Reconstructing the O&M System and iMaster NCE FabricInsight Achieving Quick Intelligent O&M**

O&M usually goes through several phases, where the first phase is to ensure stability and service rollout, as changes may pose risks. Meanwhile, O&M engineers want to achieve high visualization, which means that indicators can be measured and visualized. In the second phase, it is impractical to avoid changes with the development of financial technologies

and business needs more agile changes. In this phase, platform automation is the key. However, automation will also bring further problems, with the main challenge being that the network becomes a black box, and traditional O&M can't meet the requirements. However, a massive amount of O&M data also drives intelligent O&M based on big data and AI, leading to the third phase of AIOps.

The CMB cloud data center introduced Huawei's iMaster NCE FabricInsight network intelligent analyzer to implement automatic fault identification. The product was also designed to achieve intelligent fault locating, and potential risk prediction based on big data and AI algorithms. The major difference between FabricInsight and the traditional O&M is that FabricInsight manages the entire network from the service perspective. Each network device is a probe on the network and can perform full-path O&M management for each service flow. This allows for implementation of fault identification within one minute, fault locating within three minutes, and fault rectification within five minutes.

In July 2018, shortly after FabricInsight went online in the data center of CMB, CMB service personnel discovered a significant number of retransmission alarms were generated between the big data cluster and Kafka cluster of a channel. It was estimated there were 300,000 alarms per hour, but it wasn't possible to instantly determine the cause of the alarms. Nevertheless, the root cause was quickly found with FabricInsight's intelligent analysis. A port of a server in the Kafka

Huawei's CloudFabric data center network provides powerful support for CMB

20%

increase in throughput for the entire storage cluster

3 days

for delivery of basic networks, down from 2 weeks

1-3-5 minutes

for fault identification, fault locating, and fault rectification

cluster responded slowly to syn.ack, causing a vast number of retransmission alarms. Only several minutes were needed to locate the fault's root cause, and after the network engineer notified the service department of the cause it was confirmed by the service department. The fault was then rectified after the application was restarted.

In the traditional O&M process, service personnel have found that access is slow and the cause can't be found, so they have to call the network engineers and ask them to check the network. It usually takes a long time for network engineers to locate faults, which negatively impacts services. As a result, complaints frequently come from the business department about the network department. In the past, the network wasn't transparent and there have been numerous unclear situations. In contrast, FabricInsight makes networks more visual, which equips network O&M engineers with a greater insight into networks. CMB also has high expectations for FabricInsight, hoping to further improve intelligent functions, including intelligent prediction and automatic verification of changes. Overall, this will help CMB advance toward the ADN.

Huawei's CloudFabric data center network provides powerful support for CMB in digital transformation and digital operation reconstruction. Huawei will continue to partner with CMB to promote Retail Finance 3.0 and shape the future of financial AI. ▲

# China Everbright Bank: Building an “Intent-Driven” Next Generation WAN

By *Shi Chenyang, General Manager of CEB's Information Technology Department; Peng Xiao, Deputy General Manager of CEB's Information Technology Department; and Li Gang, Facility Management Unit of CEB's Operation and Maintenance Center*

**F**ounded in August 1992, China Everbright Bank (CEB) is a national joint-stock commercial bank approved by the State Council and the People's Bank of China. It was listed on the Shanghai Stock Exchange (SSE) in August 2010 and on the Hong Kong Stock Exchange (HKSE) in December 2013. Headquartered in Beijing, the bank provides customers with a full range of financial products and services.

As the digital economy rapidly develops, CEB is promoting a top-level design approach, along with strategic deployment, for digital transformation and the development of Financial Technology (FinTech). Over the several years of its own digital transformation process, CEB has developed a “123 + N” digital banking development system, which entails building *one* smart brain, setting up *two* technical platforms (cloud computing and big data), and improving *three* service capabilities (namely, mobile, open, and ecosystem service capabilities), and producing various smart products and services, such as cloud bill payments, cloud payments, smart loans, blockchain, and an inclusive finance cloud.

## Challenges to Traditional WANs

The Tier-1 backbone Wide Area Network (WAN) plays a vital role in CEB's “123 + N” digital banking development strategy. It is responsible for the computer processing, networking, and interconnection of banks across China — supporting nationwide, cross-bank, cross-border, and real-time deposits and withdrawals, as well as money transfers and online wealth management.

However, with increasingly fierce competition among banks, CEB's traditional WANs faced several significant challenges. For instance, the financial industry requires WANs with high availability and redundancy. However, leasing private lines from

carriers is expensive, and the costs of private lines between a bank HQ and its branches are high. To make matters worse, traditional networks can't fully capitalize on expensive private line resources. What's more, financial services are complex and their values vary, leading to differences in terms of the delays they can cope with and the amount of bandwidth required from the WAN. Traditional networks can't detect network traffic status in real-time nor from a global perspective, and can only monitor and detect traffic on certain links, lacking detection methods for all Quality of Service (QoS) queues. As a result, alarms can't be generated efficiently, the QoS service queue configuration can't be optimized synchronously, and the transmission quality of critical services can't be guaranteed.

Meanwhile, flexible network optimization is necessary to cope with various financial services and network changes. Traditional networks don't support fine-grained control and scheduling and lack flexible WAN traffic optimization capabilities.

## Management, Control, and Analysis Requirements

CEB's legacy WAN connected the bank's data centers and branches through lines leased from carriers, with additional redundant lines improving network availability. Because most carriers charge for leased lines based on bandwidth, the WAN's daily operation costs were high. Based on service

*The backbone WAN plays an important part in CEB's "123 + N" strategy. CEB and Huawei worked together to deploy an intent-driven Software-Defined Networking (SDN) solution for WANs, featuring integrated management, control, and analysis as well as high applicability in real-world scenarios. The solution is designed for large-scale financial WANs.*

management requirements, CEB classifies its WAN traffic into production, office, test, voice, video, and big data traffic. To make the most of precious line resources, CEB planned to deploy different types of traffic on different lines to form a redundancy mechanism that supports mutual backup. Yet different types of WAN traffic have different characteristics and service values, and they have varied network management and control requirements. Since different types of traffic were placing different requirements on network latency and bandwidth, complex QoS queues needed to be enabled to guarantee and manage services. But manually maintained QoS queue configurations are complex, with traffic changing dynamically along with service development. Static QoS queues simply couldn't detect such traffic changes in an acceptable timeframe.

Indeed, CEB's existing network management platforms were unable to detect network traffic status in real-time nor from a global perspective, and could only monitor and detect traffic on certain links, lacking detection methods for all QoS queues. This meant that alarms couldn't be generated efficiently, the QoS service queue configuration couldn't be optimized synchronously, and the transmission quality of critical services wasn't guaranteed.

When WAN line quality deteriorated — suffering from packet loss, delays, and jittering — the bank's legacy routing protocols were unable to detect the deterioration in real-

time nor implement dynamic line switching. Finally, traditional routing protocols couldn't — and can't — flexibly select lines based on service types. CEB's WAN lacked a network-wide "brain" for centralized management and control and was unable to implement centralized traffic scheduling and control policies. As a result, bandwidth usage was unbalanced and line resources were being wasted.

CEB's network management, control, and analysis requirements were numerous, summarized as:

**Network awareness capability:** To improve the refined management capability of the WAN, network traffic awareness capability needed to be provided with network changes detected quickly. Specifically, visualization of different types of application traffic on the entire network had to be supported, with the running status of each line tracked to generate

#### About CEB

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*Through joint innovation, CEB and Huawei have incubated a WAN architecture solution that integrates management, control, and analysis. The solution is more intelligent in terms of management, supporting a global perspective and intelligent decision-making. >>*

a scoring and evaluation mechanism. Moreover, the congestion of each QoS application queue needed to be detected in real-time, with the status of lines and queues displayed in multiple dimensions.

**Network analysis capability:** Based on network awareness and visualization, the solution CEB sought needed to be able to analyze historical big data of line and queue traffic, identify communication characteristics and periodic traffic characteristics of various applications, and analyze and predict subsequent traffic of lines and queues.

**Network control capability:** To better adapt to network traffic, the bank wanted combined alarm policies to be defined based on bandwidth usage, latency, packet loss rate in a specified period, and duration of links and QoS queues. In addition, a centralized management and control mode was required, to flexibly select lines based on network traffic policies and service types.

Meanwhile, QoS queue parameters needed to be able to be adjusted on demand, implementing centralized traffic scheduling and control policies.

**Network intelligence:** With a need for real-time network awareness, traffic feature analysis, and centralized line adjustment and control capabilities, CEB also wanted Artificial Intelligence (AI) and Machine Learning (ML) to be used to build an intelligent WAN system, featuring high security as well as self-learning, self-adjustment, and self-protection capabilities. The bank wanted its intelligent WAN to have the ability to detect faults before provisioning services, freeing network administrators from repetitive work, reducing Operations and Maintenance (O&M) costs, facilitating troubleshooting, and enabling more efficient service delivery, better security, and an improved user experience.

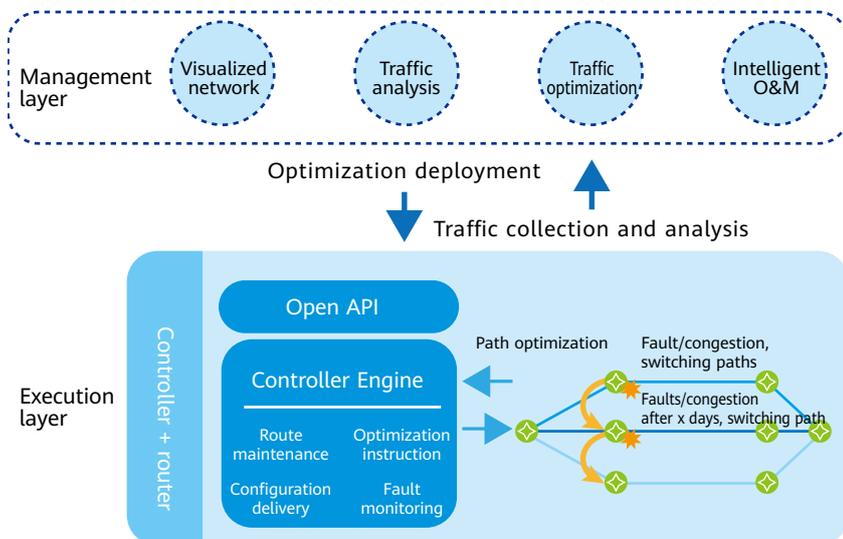


Figure 1: The next generation intelligent WAN SDN architecture of CEB

### Building the SDN Architecture for CEB's WAN

Through joint innovation, CEB and Huawei have incubated a WAN architecture solution that integrates management, control, and analysis. The solution is more intelligent in terms of management, supporting a global perspective and intelligent decision-making. Automation is now implemented at the control layer, with controllers replacing manual O&M. On the forwarding plane, routers and lines have been upgraded, and Segment Routing-Traffic Engineering (SR-TE) tunnels are deployed across networks.

Controllers are responsible for an enormous workload, including traffic

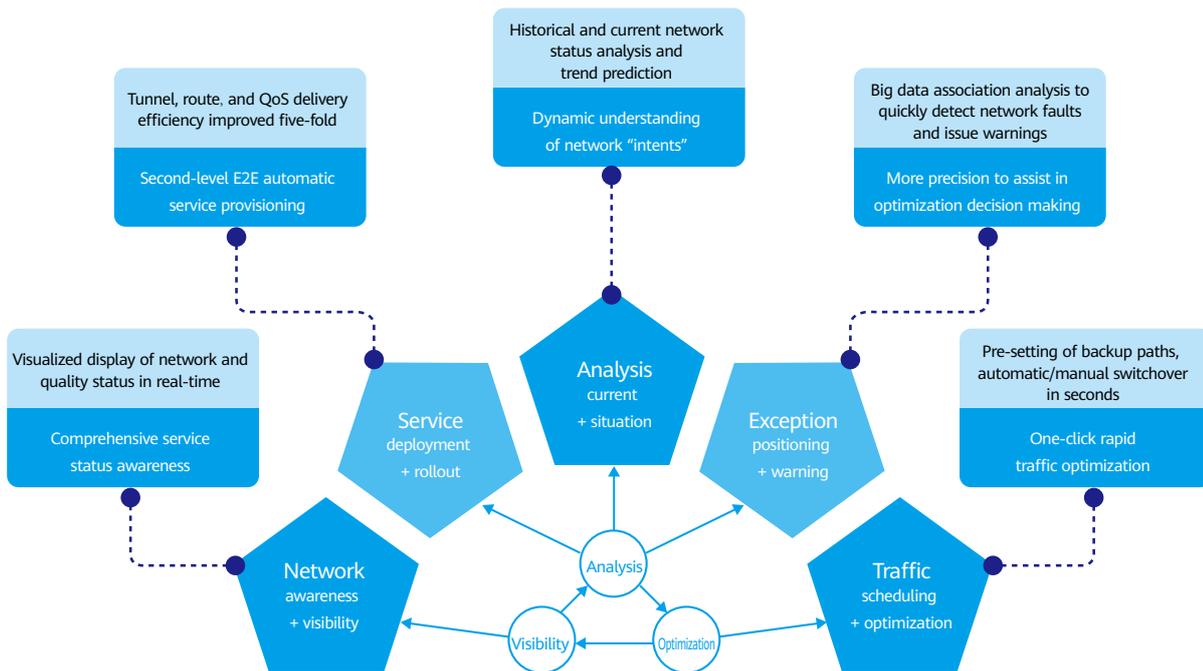


Figure 2: CEB's next generation intelligent WAN innovations

optimization, path computation, and decision delivery at the forwarding layer. Considering network scale and network availability requirements, there was a risk that controllers would perform too many tasks at the control layer. Therefore, the WAN SDN controller was positioned as the task executor for traffic scheduling and management, responsible for scheduling and executing tasks such as northbound path computation and label delivery. The decision-making tasks originally performed by controllers were transferred to the task manager for network optimization analysis and decision-making. The programmability of the task manager and the scheduling capability of the controller ensure openness at the control layer, preventing control plane faults from affecting the network and ensuring stable and reliable running for the network.

In terms of route implementation at the forwarding layer, the Multiprotocol Label Switching Segment-Routing (MPLS-SR) solution is most suitable for financial WANs — this is what was selected by CEB, after comparison of multiple solutions. MPLS-SR uses lightweight tunnel label forwarding technology, which specifies the original path at the source. The controller calculates MPLS tunnel paths and delivers labels to the

entire network through Border Gateway Protocol-Link State (BGP-LS) extension, to instruct routers to establish bidirectional traffic tunnels and construct a local forwarding table after receiving the labels delivered by the controller. After receiving MPLS packets, routers check the label carried in the packet and forward the packet based on the local label forwarding table. Solution verification showed that simple and flexible MPLS-SR technology was able to fully meet the requirements of dynamic path adjustment.

### Five Innovations of the WAN SDN Solution

The intent-driven WAN SDN solution of CEB can be applied in many scenarios and is especially suitable for large-scale financial WAN environments.

**Comprehensive service status awareness:** The solution visualizes networks and services. The open platform detects and checks devices, lines, and application channels in multiple dimensions, and dynamically detects and displays network and service traffic status, improving the visualization of WAN traffic, paths, and services.

**Accurate auxiliary services to optimize decision-making:** Big data analytics is used to identify potential



*CEB will continue developing and promoting the application of technologies such as telemetry and big data, optimize its next generation intelligent WAN, improve refined service awareness capabilities, and enhance application traffic scheduling capability based on service requirements. >>*

risks and proactively provide warnings. In addition, views of device status data can be displayed, facilitating real-time monitoring of mobile bearer network quality and fault locating. Meanwhile, current network running status can be viewed and automatically updated in real-time, enabling key event monitoring and risk avoidance.

**One-click fast traffic optimization:** Fine-grained detection and automatic scheduling are implemented. Based on high-frequency, fine-grained detection at the application channel level, line quality changes and service quality status can be agilely detected, with adaptive network channel path switching automatically performed. For example, CEB uses three physical WAN links between its headquarters and branches, while most enterprises use two active/standby links. Although two lines are less costly than three, three lines support more scheduling policies, higher redundancy, and finer granularity — improving bandwidth usage, reducing the total bandwidth requirement, and facilitating fast traffic optimization.

**Dynamic understanding of network “intents”:** The control platform implements line switching through AI-based intent learning. Through continuous big data sampling, learning, and analytics, the control platform can dynamically analyze the traffic period and trend of services based on AI algorithms, and propose corresponding link switching plans in advance. This way, intent-driven network switching can be performed to better meet service traffic requirements. For example, as the brain of intelligent scheduling, the intelligent network management center can obtain current traffic information in real-time through

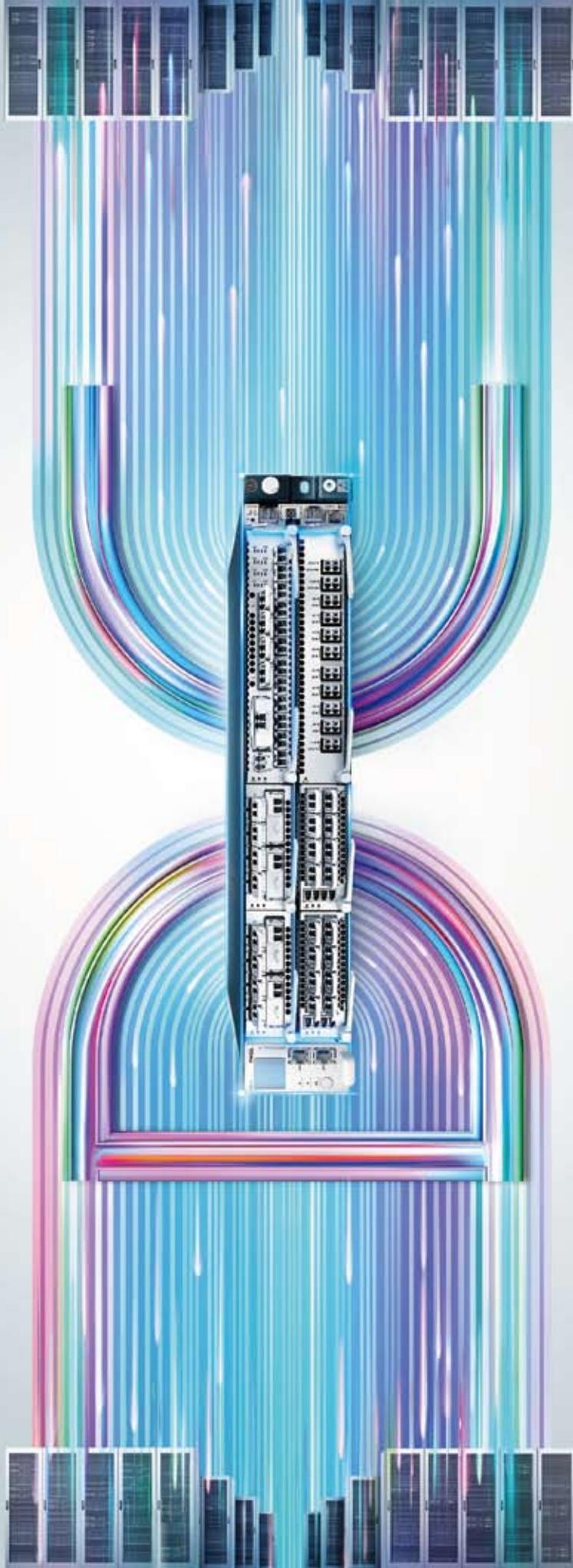
telemetry. Based on big data information — including historical traffic, service requirements, topology, and tunnel information — the intelligent network management center uses AI for continuous optimization and training, eliminating the need for manual network management and forming a real intent-driven, intelligent WAN.

**Second-level automatic End-to-End (E2E) service provisioning:** Automatic configuration delivery is implemented. Based on incremental increases in bandwidth requirements brought by new service rollout and existing service development, automatic QoS configuration delivery is provided for 120 devices on the entire network, greatly improving the network’s O&M efficiency.

### Empowering CEB’s Digital Transformation

With the implementation of the next-generation intelligent WAN SDN project, CEB has visualized the network traffic and services of its headquarters and branches, enabled agile service rollout through automatic configuration delivery, and ensured the continuous and stable running of all the applications and systems of the bank, by adopting intelligent scheduling and intent-driven network switching.

CEB will continue developing and promoting the application of technologies such as telemetry and big data, optimize its next generation intelligent WAN, improve refined service awareness capabilities, and enhance application traffic scheduling capability based on service requirements. Using technological capabilities to empower digital transformation and service development, Huawei aims to help CEB grow into a world-class bank. ▲



From an Optical Industry Leader

## Huawei OptiXtrans DC908, Connecting Every Data Center Freely

88T/fiber, one-click automatic deployment, proactive O&M based on AI chips

Building a Fully Connected, Intelligent World





# China CITIC Bank Goes Digital with Huawei All-Flash Storage

## All-Flash Upgrade of IT Systems for Enhanced Competitiveness

In the era of digitalization, industries are forced to adapt and develop their Information Technology (IT) systems to stay relevant. The financial sector is no exception. Developing Financial Technology (FinTech) and improving IT governance capabilities, then, are now essential for banks if they are to offer the services their customers require.

As the key infrastructure for carrying financial services, a bank's Data Center (DC) is its lifeline, covering the core and front-end systems, and keeping payments, card exchanges, mobile banking, e-banking, counter services, and the credit card system operating stably.

While servers, networks, and storage can be considered the three pillars of a bank's IT infrastructure, storage — the accommodation of data — plays an especially important role in ensuring data security, as well as maintaining rapid and efficient data processing.

In terms of data storage, flash disks are the preferred choice for financial institutions to undertake informatization. Such disks provide high performance with low rates of failure, and their small physical footprint means more availability of invaluable space in equipment rooms.

Pioneering the upgrade to all-flash, China CITIC Bank (CCB)

has replaced its traditional storage with Huawei's OceanStor Dorado flagship all-flash storage system, to build a platform that can process the data of its critical transaction systems with ease. The storage pools of CCB's production systems have all been upgraded to high-end all-flash storage arrays, with clear benefits gained.

**Large-capacity all-flash storage improves system reliability:** Compared with Hard Disk Drives (HDDs), OceanStor Dorado's Solid State Drives (SSDs) feature five times higher reliability and support hundreds of thousands of Input/Output Operations Per Second (IOPS). Their performance is clearly powerful enough to satisfy the needs of multiple service systems for high concurrency and low latency during peak hours.

Huawei fully understands the complexity involved in, and critical importance of, data storage. Its OceanStor Dorado high-end all-flash storage can implement end-to-end acceleration on key paths such as transmission, computing, intelligence, storage, and management — ensuring IT systems and services run smoothly during peak hours.

**Large-capacity all-flash storage shortens response times and improves data processing efficiency:** Banks are constantly pursuing faster and faster IT systems to cope with the influx of enormous data volumes. With all-flash storage, read/write

*In 2020, China CITIC Bank replaced its traditional storage with Huawei's high-end OceanStor Dorado all-flash storage system, marking the beginning of CCB's journey to building an advanced digital commercial bank.*

latency is slashed, ensuring high-performance processing of service data. CCB adopted such high-end all-flash storage to break the limit of millisecond-level storage response times, enabling faster transactions and a better service experience for customers.

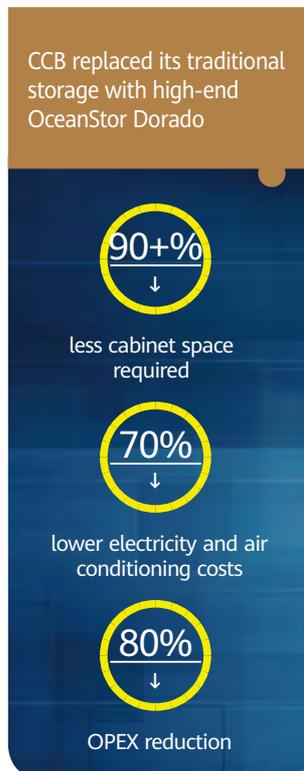
#### **Large-capacity all-flash storage greatly reduces Operations and Maintenance (O&M) risks:**

In CCB's initial planning stages, scalability wasn't sufficiently prioritized. They reached a point where their reserved storage resources could no longer meet the needs of rapidly growing service data, requiring new storage devices to be purchased and additional data to be migrated. This is a waste of resources and an O&M nightmare, with the wide range of potential risks that arise during data migration.

The elastic architecture found in a high-end all-flash system such as OceanStor Dorado supports a high level of scalability, helping banks effectively cope with unpredictable explosive service growth in the new era.

#### **Applying Technology to Build a Green Data Center**

For banks to achieve digital transformation, they must strive to simplify front-end processes, centralize back-end big data processing, create agile product and service feedback mechanisms, and make risk control more compliant. CCB has long been applying technology to improve IT governance and



strengthen IT infrastructure construction, making it one of the top banks in China with the most advanced information technology. By the end of 2019, the capacity of OceanStor Dorado systems deployed in CCB's mission-critical service databases exceeded 10 PB. Traditional storage systems with such large capacity would normally occupy huge space in equipment rooms. However, a single 3.84 TB SSD is now the standard disk found in Huawei's OceanStor Dorado system, replacing the traditional 300 GB HDDs. Together with Huawei's intelligent data reduction technology, one cabinet can now support 1 PB of available capacity, reducing required cabinet space by more than 90 percent. In addition, electricity and air conditioning costs are reduced by approximately 70 percent, which in turn slashes Operating Expenditure (OPEX) by up to 80 percent. The idea of creating real-world green data centers has now become a reality.

CCB will continue to drive technological innovation and promote the application of FinTech. The bank will cooperate with top infrastructure suppliers and Information and Communications Technology (ICT) solutions providers to jointly accelerate digital transformation in the financial industry, with the aim of building a brand new digital bank, better serving the customer as well as facilitating national economic development. ▲

# Piraeus Bank: All-Flash Storage Meets Ever-Growing Demand for New IT Services

**A**thens is the capital of Greece. It's a liveable city that incorporates historical, classical, and modern elements. The city is a center for the arts, learning, and philosophy, as well as a center of Greek industry, politics, culture, and finance. One of the city's landmarks is Piraeus Bank, with a history spanning over 100 years. Founded in 1916, Piraeus Bank



*The successful cooperation between Huawei and Piraeus Bank in the all-flash storage field is a miniature of the cooperation between Huawei and the Greek banking industry. Huawei is committed to becoming a preferred partner of digital transformation for Greek banks by providing a wide range of competitive products and solutions.*

is the largest bank in Greece and occupies the largest share of customer loans and deposits, accounting for 29 percent. The bank provides comprehensive financial products and services for more than 5.4 million customers through its network of approximately 540 branches in Greece.

The Greek economy has been growing and unemployment has been falling since 2017, and both trends will likely accelerate in the following years.

The macroeconomic fundamentals and prospects of the Greek economy improved further in 2019, positively affecting the economic climate. This has contributed to the improvement of banking sector financing and liquidity.

The majority of business sector leading indicators reflect the recovery of economic activity (PMI etc.).

The Greek banking system is stronger, following major consolidation, restructuring, and deleveraging efforts. Challenges to banks' profitability include the high stock of Non-Performing Exposures, the low interest rate environment and increasing regulatory requirements. Interest income makes up a large part of banks' operating income, and Greek banks are addressing this issue by adjusting their business models to further diversify income and lower their cost base.

Greek banks are stepping up efforts in becoming more efficient, with key drivers being in exploiting new technologies, rationalizing their networks and optimizing resources.

### **Piraeus Bank Keeps Advancing**

Piraeus Bank has committed to play a leading role in the restart and development of the Greek economy by actively supporting economic activity and extroversion through

specialized and personalized solutions and high-level services to its approximately 5.4 million customers.

Piraeus Bank is turning the page, building on the successful completion of strategy. The bank is committed to make the most of its capacity to serve and support the Greek economy and deliver for its customers, shareholders, and employees. Piraeus is focused on producing results and generating value for all of its stakeholders.

By adopting these winning strategies, Piraeus Bank is on track to attain its medium-term aspirations, while continuing to invest for the future.

### **Digital Business Becomes a Strategic Driver for Piraeus Bank**

For years, Piraeus Bank has been actively embracing digital transformation and become a digital leader in Greece. The bank launched an automated electronic branch, known as "e-branch," to provide transaction services and unique experience in 2016; in 2017, it redesigned winbank (its web banking platform) and launched an online real estate website

#### **About Piraeus Bank**

Piraeus Bank, with a history spanning over 100 years, was founded in 1916. Piraeus Bank is the largest bank in Greece and occupies the largest share of customer loans and deposits, accounting for 29 percent. The bank provides comprehensive financial products and services for more than 5.4 million customers through its network of approximately 540 branches in Greece.



*Powered by intelligent chips, advanced architecture, intelligent algorithms, and gateway-free active-active solution, the OceanStor Dorado V3 greatly improves service performance, reduce latency, and ensure high reliability. >>*

for the public. The e-branch solution has played an important role as the bank has cut its physical branches and costs.

Agenda 2023 specifies the strategic digital business drivers, covering efficiency through migration to digital, digital differentiation and engagement, and online sales. The bank aims to achieve world-class digital results by 2023. Digital business and transformation drive the implementation of Piraeus Bank's business strategy.

### Piraeus Bank's Ever-Growing Demand for New IT Services and Huawei's Solution

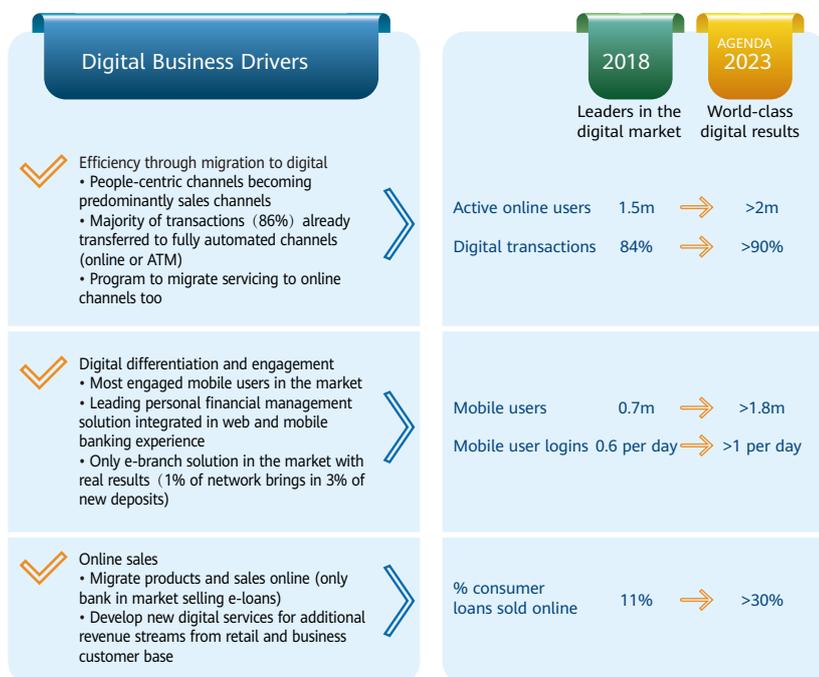
To meet the ever-growing demand for new IT services, Piraeus Bank has to use flexible systems that are able to sustain this trend. The bank needs to cover new trends, such as big data, AI, and containers while it continues

to support older technologies, including legacy systems. To meet this need, Huawei has cooperated with the bank on digital transformation. Huawei all-flash storage is an example of this.

The existing storage devices had various technical problems. For instance, these devices failed to scale on demand due to their degraded performance, slow response, and limited scalability after deduplication and compression were enabled. In addition, limited storage capability couldn't process the ever-increasing data volume or exponential data growth during digital transformation. To solve these issues, the bank needed a new storage system featuring automated provisioning, capacity on demand, easy failover, better resource usage, and secure data migration.

In July 2018, Huawei discussed needs with Piraeus Bank's IT O&M team. After several rounds of in-depth communication, the two parties reached an agreement that Huawei's all-flash storage products could enter the PoC test. Based on the understanding of the bank's needs, Huawei recommended the OceanStor Dorado V3 all-flash storage system for the PoC test and replacement of existing storage systems.

The two parties initiated the PoC test, and completed it in October 2018, winning recognition from the bank. In addition, to ensure the security of the legacy system and suitability of Huawei all-flash storage, the bank tested storage devices in the test environment as well as in production with heavy workload demands for more than six months. Through all these tests, the bank thought that Huawei all-flash storage



covered 100 percent of its needs.

“Huawei was chosen following a very demanding PoC during which we applied several tests to verify its performance, reliability, compatibility with existing infrastructure and of course support from Huawei services. These tests lasted more than six months, during which Huawei AFA covered 100 percent our needs. We had the opportunity to use it not only in test environment, but also in production with heavy workload demands. So, when we were confident for the suitability of the system, we proceeded with the adoption of Huawei as one of the enterprise storage providers of the bank,” said Haris Voutsas, Assistant General Manager, Group IT Operations, Piraeus Bank.

### **Huawei All-Flash Storage Provides Uninterrupted Availability and Flexibility in Handling a Mix of Diverse Systems**

In June 2019, Huawei OceanStor Dorado V3 all-flash storage system replaced the existing storage system. Since the system went live, the bank has been continuously migrating production services and data to the system, such as virtual servers, databases, application servers, and BIs. The system has run effectively and improved IOPS performance linearly while maintaining fast, reliable, and stable response. As a result, it has effectively alleviated Piraeus Bank’s business growth pressure, improving its operational efficiency and customer satisfaction.

Powered by intelligent chips, advanced architecture, intelligent algorithms, and gateway-free active-active solution, the OceanStor Dorado V3 greatly improves service

performance, reduces latency, and ensures high reliability. The system architecture and embedded technologies deliver high cost effectiveness so that Piraeus Bank can economically configure immediate and future storage capacities, minimizing its Total Cost of Ownership (TCO).

Piraeus Bank was impressed by the successful collaboration. “As I have already stated, before we proceeded with Huawei we had a very thorough PoC that confirmed the suitability of Huawei AFA for our needs. So yes, our experience so far is excellent, and we consider Huawei a trusted partner that we can rely on,” said Haris Voutsas, “Huawei has a very strong technological background, and its products are on par with if not better than, ones of the major IT vendors. During the last year, we have seen a constant improvement of the AFAs with new versions, which implies investment in R&D and commitment to its products.”

The successful cooperation between Huawei and Piraeus Bank in the all-flash storage field is a miniature of the cooperation between Huawei and Greek banking industry. Huawei has collaborated extensively with Greek banks by providing a wide range of competitive products and solutions. It is committed to becoming a preferred partner of digital transformation for Greek banks.

Archimedes, a famed scholar in ancient Greece, once said: “Give me a place to stand, and I shall move the world.” Some 2,000 years later, with the Greek banking industry facing tremendous challenges and undergoing digital transformation, Huawei is keen to work with more Greek banks, creating more “places to stand” — to propel the sector’s development and digital transformation. ▲

Huawei All-Flash Storage effectively alleviated Piraeus Bank’s business growth pressure

3 times  
↑

improvement in business performance

24/7  
hours

business continuity

75%

OPEX saving

# Ghana Commercial Bank Implements a Mobile Money Strategy

In Ghana, mobile payment services are growing rapidly. Approximately 73 percent of all transactions nationwide are now conducted using mobile money, from making payments at various physical and online retail stores, to buying phone credit and purchasing a wide range of goods and services. In recent years, mobile money transactions in Ghana have increased by more than 100 percent year-on-year. By September 2018, in a country of roughly 30 million people, there were reportedly already more than 31.4 million mobile money accounts and 8.2 million regular active users nationwide. Those numbers keep on growing.



*Huawei provided GCB with an updated mobile money platform – G-Money – which has since helped the bank achieve a 10-fold increase in its mobile services and been the bedrock, in more general terms, of building a new banking ecosystem.*

### Ghana's Government Boots Mobile Money Growth

This growth has been actively supported by the government. Recognizing that Kenya's robust mobile money industry helped the country achieve financial inclusion, Ghana's government revised its own financial market regulations — under the guidance of the World Bank — hoping to achieve similar results. The new regulations allowed non-bank enterprises to provide financial services and successfully boosted both Ghana's mobile money industry and the national level of financial inclusion.

Ghana's mobile money service industry has rapidly developed since, with many mobile network operators moving into the finance space. Unsurprisingly, this has significantly impacted the nation's traditional banking industry. And as this trend of mobile money growth continues, with banks competing with carriers, the former will have to be innovative in the delivery of financial services if they are to stay afloat.

Ghana Commercial Bank (GCB) is Ghana's largest commercial bank. GCB has served customers for more than 60 years and has over 1.5 million monthly active bank accounts and more than 180 physical branches. It believes that mobile money is inherently a banking service — not a carrier concern — and it has therefore offered a mobile money service since 2018.

### GCB Seeks to Develop Mobile Money Platform

GCB sought to develop this mobile money service and a mobile money platform into one that could be used for easy cross-platform payments. The bank also wanted to offer customers a large portfolio of services by integrating other banks into a wider mobile payment ecosystem.

GCB firmly believed that mobile money would help grow its market share, offering services for more people at minimal

cost, in turn improving the payment experience in Ghana and helping to improve people's lifestyles by providing additional financial services such as small loans. With this in mind, GCB formulated a plan for implementing its mobile money platform.

The plan was to support a mobile money agent service, which already had 200 branches. GCB sought to deploy more agents and merchants, and aggregate existing networks of agents in support. Another target was the modernization of Point of Service (PoS) terminals and Automatic Teller Machines (ATM), so that both could support the mobile money service. Finally, GCB wanted to offer a diverse range of services, including credit loans, to make its mobile money services more appealing to customers.

### Huawei Provides Mobile Money Solution

GCB was looking for partners who could help implement its mobile money strategy. Huawei stood out as an attractive option because of its extensive investment and practical experience in the financial field, having successfully deployed mobile money platforms in various countries, including fellow African nation Kenya.

#### About GCB

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G-Money mobile money platform helps GCB grow its market share

60K

new customers in a single month

10 times

more customers within one month

700K+

mobile money users by April 2020

With vast experience in the global mobile money field — having worked on bKash, a mobile financial service for Bangladesh Bank, and Kenya Commercial Bank’s (KCB) mobile money service, M-PESA — Huawei is widely regarded as extremely reliable in this domain.

Huawei is also able to draw on its experience in the Chinese market, which is the world leader in mobile payments, and apply it in Ghana. Huawei also has strong Research and Development (R&D) credentials and local teams, so it can support the sustained, long-term development of GCB’s services. Given all of these advantages, GCB believed that Huawei would be a suitable long-term partner.

Huawei provided GCB with an updated mobile money platform — G-Money — that launched in December 2019. G-Money has since helped the bank achieve a 10-fold increase in its mobile services and been the bedrock, in more general terms, of building a new banking ecosystem.

In terms of services, the solution is developed based on an open banking framework, enabling it to build a new service ecosystem and actively promote innovation of the business model. In terms of technologies, the solution is built using an open cloud architecture and micro-service architecture, and supports elastic scaling and continuous optimization of service processes, ultimately laying a solid foundation for the digital transformation of all bank services.

After the commercialization of the G-Money mobile money platform, GCB gained 60,000 new customers in a single month — 10 times the previous month’s figure. By April 2020, there were more than

700,000 mobile money users.

GCB’s future mobile money strategy is divided into three phases: mobile wallet, mobile payment, and mobile finance.

**Mobile wallet:** Through the mobile money platform, GCB will be able to compete with carrier networks for customers in Ghana, with the mobile wallet service providing basic financial services, such as deposits and withdrawals, transfers, and batch transactions.

G-Money also connects to all other banks through the Bank of Ghana’s Ghana Interbank Payment and Settlement Systems (GhIPSS).

**Mobile payment:** GCB has greater plans to enable QR code-based payment, refined management, smart operations, and an open ecosystem. Open Application Programming Interfaces (APIs) for the mobile payment platform help provide pre-sales and after-sales services for local merchants, effectively building a local mobile payment ecosystem.

The mobile payment platform also supports the construction of a mobile payment ecosystem, accelerating the shift toward a cashless society and supporting digital and intelligent lifestyles. Another key aim of GCB’s mobile payment platform is to enable service providers from various industries to join the ecosystem and provide users and merchants with more payment scenarios.

**Mobile finance:** As the local financial market continues to develop and innovate, banks will look to capitalize on the unique advantages they have over mobile network operators to attract customers, offering overdrafts, small loans, and insurance services — all on a mobile platform. ▲

# HUAWEI IdeaHub

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Accelerating Financial Innovation



# Chinasoft International and Huawei Build Financial Digital Infrastructure Together

By Chen Yuhong, Chairman and CEO of Chinasoft International

As China returns to some sense of normality, following the lockdown period associated with the COVID-19 pandemic, the “One Belt, One Road” and “New Infrastructure” initiatives are gaining fresh investment. China’s financial industry, too, is also attracting new investment and finding further opportunities. Meanwhile, data centers and digital infrastructure — such as 5G — are driving the digital transformation of the finance industry.

## How Do Financial Service Enterprises Deploy FinTech?

Ahead of the imminent digitalization of the entire financial industry, financial enterprises need to take into account the needs of the industry ecosystem, services, management, and customers when they invest in digital technologies. While considering the requirements for both real-time operation and future innovation, these enterprises must develop strategies that are both forward-thinking and pragmatic.

To meet that need, Chinasoft International — a Beijing-based investment holding company, with expertise in financial technical services, business strategies, and technology-driven methodologies — proposes nine principles for the technical deployment of financial enterprises.

**Business strategy orientation:** Digital transformation should align with an enterprise’s overall strategy, which means it is important to avoid generic transformation methods and ensure that any transformation adds tangible value to the business.

**Systematic implementation:** Enterprise governance and

digitalization are gradual processes, which can’t be achieved overnight, so investment in these areas should be steady.

**Standards-based:** Sustainable standardization of services is vital to achieving digitalization.

**Five aspects of closed-loop evolution:** When enterprises digitalize, they should consider service data, data assets, asset science and technology, Artificial Intelligence (AI), and intelligent scenario-based services — to form a closed-loop from service data to data service.

**Embracing new technologies and systems:** By working with new technologies, we can gain a better understanding of the technological cycle, to ensure new technologies are reliable.

**Data asset core:** The motive driving the digitalization of financial institutions is the wish to maximize the value of information assets. Customer and financial transaction data are critical assets that financial enterprises should explore in depth.

**Customer value center:** Digital transformation should be customer-centric and increase customer engagement and involvement. Technical and data infrastructure should be

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designed with the intention of developing scenario-based innovative services.

**Sustainable improvement of digital capabilities:**

Digitalization is heavily dependent on an enterprise's digital assets. This means enterprises must strive to internally improve data management, application, analysis, and identification capabilities, and treat this work as an ongoing process.

**Basic ecosystem construction:** An ecosystem covering an enterprise's operation environment, data governance, and organizational structure and culture must be established. A basic ecosystem is the foundation of all the other principles.

Chinasoft International proposes these principles based on the trend for core data technologies, which are fundamental to the digitalization of the financial sector. For banks focused on risk management and banks that need to apply quantitative computing to achieve refined management, the large amount of data processed remains internal structured data.

Meanwhile, mainstream big data products in the market still use the set operation principle of structured data, which is determined by the basic data structure of computer technologies. For most industries — if there's no disruptive breakthrough in the technical principle chain — relational databases and SQL remain the most mainstream, simple, and stable processing policies. In an enterprise-level application scenario, the data technical solution can be partially optimized, but complete replacement of the solution isn't feasible.

Big data and AI technologies are well-suited for use in financial enterprises. Although bottom-layer technologies have an abundance of open source projects, financial enterprises increasingly rely on large platform enterprises, because these

enterprises conduct superior cutting-edge research, carry out regular upgrades, and regularly perform Operations and Maintenance (O&M). The stability and sustainability of technologies developed by platform enterprises are far superior to those of non-technology-oriented enterprises, which typically employ one or two technical experts. Only large platform enterprises can carry out constant product iteration and optimization based on extensive user practices.

**Chinasoft International and Huawei Empower Financial Enterprises**

Huawei is a leader in digital transformation, an advocate of cloud architecture, and a major contributor to big data and AI technologies. Huawei's comprehensive Financial Technology (FinTech) ecosystem components are rooted in its years of expertise in the financial industry, as well as unparalleled technical investment and ecosystem construction. In other words, Huawei is a leading platform enterprise that many financial enterprises choose to enable their digitalization process.

In the past two decades, Huawei has accumulated vast experience in information technology construction and development, carrying out many joint innovation projects with financial institutions to reshape platforms, data, and services. This process has involved promoting the transformation of traditional closed architecture, to open distributed architecture, with the intention of transforming the bottom-layer financial platform.

Another key aspect of those joint projects has been research and insight into big data technology, to achieve



*Chinasoft International is a data platform and application construction technology provider, delivering end-to-end lifecycle coverage for products and services in the financial industry.*

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targeted marketing and real-time risk control. Meanwhile, the integration of video collaboration into current online channels helped to build an omni-channel service mode. And remote service visualization, as well as online channel integration and sharing, create a secure and consistent multi-channel service experience for users.

Chinasoft International is a major Chinese enterprise that provides software technologies and enterprise informatization services. Its service objects and solutions cover most financial institutions and management departments in China, including banking, securities, insurance, funds, trusts, Internet finance, and consumer finance. It is also an important contributor to — and leader in — informatizing and digitalizing China's financial industry.

Specifically, Chinasoft International is a data platform and application construction technology provider, delivering end-to-end lifecycle coverage for products and services in the financial industry. It integrates Huawei's technical ecosystem components with its own expertise in the sector, working together to achieve industry digitalization and sustainable development.

In more detail, the partnership between Chinasoft International and Huawei is built on:

**An efficient data environment:** The extensive experience that Chinasoft International has acquired in data warehouse and data platform construction, along with Huawei's infrastructure products, resulted in the two organizations launching a new middle platform solution for financial data. This solution includes the industry's data model, indicator system, as well as a comprehensive operation management and decision-making system, and the data product service and management system. Based

on the characteristics of both banking services and Huawei's products, Chinasoft International provides a secure, reliable, efficient, and comprehensive solution for the basic data service environment of banks. Combining the mature solutions of Chinasoft International's solutions and Huawei's products can enhance the foundation for financial enterprises' digital transformation, helping them shift from a data warehouse to a data middle platform, and from data technology-enabled decision-making to data service-driven business development.

That process is exemplified by a large joint-stock bank that has constructed a new data environment using Huawei's products. A stock exchange also used Huawei platform products to replace its traditional data warehouse products while upgrading its basic data platform. In all these cases, Chinasoft International helped customers conduct overall service and technical architectural planning and provided end-to-end support for solution implementation, laying a solid foundation for the customer's digitalization strategy.

**Data asset management:** Data asset management is a vital task in enterprise data construction. Chinasoft International is well versed in data asset management, having developed solutions in each of the data asset management fields — covering data standards, quality, metadata, security, and master data in fields such as banking, insurance, and securities. Based on Huawei's big data and AI platform tools, Chinasoft International can help financial enterprises streamline data asset operation and management, data standards and service specifications, and data quality and service quality. This helps enterprises implement the streamlining of scenarios, services, processes,



*Chinasoft International is a valuable partner in the Huawei Kunpeng computing industry ecosystem. The two organizations have extensive, high-level cooperation in software outsourcing services, cloud solutions, and big data technologies.*

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regulations, and data. It also provides them with available, reliable, and sustainable data “fuels” for digital transformation. By combining its data asset management products with Huawei’s data platform products, Chinasoft International has developed a data middle platform solution that is equipped with good service scalability and industry adaptability. The solution has been applied to multiple financial institutions, including commercial banks, and has been well received by customers.

**Targeted marketing:** By capitalizing on the technologies of the two organizations, banks can effortlessly store and analyze user transaction data, similar to how Internet financial enterprises do. This helps banks accurately understand user preferences and requirements and quickly launch innovative products and mobile Internet-based financial services. The platform Huawei provides has allowed a large, well-known joint-stock bank to implement precision-marketing. Chinasoft International plays an important role in such solution architecture and implementation.

**Real-time fraud prevention:** Chinasoft International deploys its advanced financial service solutions on Huawei’s platform to achieve millisecond-level computing speed and the computing of thousands of complex rules. Chinasoft International guarantees zero service interruption and zero data loss, boosting the risk management ability of financial enterprises. This solution — which Huawei and Chinasoft International collaborate on — has also been applied to a next generation, real-time, intelligent anti-fraud platform of a large joint-stock bank.

**International expansion:** Chinasoft International has IT service delivery teams all around the world, and has implemented its cloud services, AI, and Smart City initiatives on a global

scale. It has become an invaluable partner of Huawei, helping to internationalize Huawei’s products in multiple industries, including carrier, finance, entertainment, and education. For example, in Malaysia, Chinasoft International and Huawei provided digital transformation products and services to financial enterprises. They also designed and implemented a comprehensive data ecosystem construction solution for Malaysia’s Hong Leong Bank, and applied the solution in fields such as the data platform, customer identification and profiling, targeted marketing and customer operations, and risk control. They also helped the bank train a team to support its sustainable development.

Chinasoft International is a strategic partner of Huawei and a particularly valuable partner in the Huawei Kunpeng computing industry ecosystem. The two organizations have extensive, high-level cooperation in software outsourcing services, cloud solutions, and big data technologies. With its vast industrial digital experience and combined platform, operation, and ecosystem capabilities, Chinasoft International can satisfy a diverse range of customer requirements, and help drive the digitalization of the financial industry. ▲

### Partner Testimonial



Digital infrastructure is the driving force of digitalization. The improvement of data convergence capabilities, business service capabilities, and data asset management capabilities is critical to the digitalization of financial institutions. Chinasoft International is China’s leading provider of digital infrastructure for the financial industry. It will cooperate with Huawei to drive the digitalization and sustainable development of the financial industry.

— Chen Yuhong, Chairman and CEO of Chinasoft International

# Sunline Technology and Huawei: Transforming Global FinTech with Chinese Wisdom

By Li Jinsong, President of Sunline Technology

**T**he global economic turbulence we are witnessing in 2020 will likely be more severe and challenging than any other financial crises we have experienced. Indeed, since we entered the industrial era, nothing has stopped human-to-human interaction so abruptly and completely as the outbreak of COVID-19.

Over the past few years, the deepening of China's financial reform has forced traditional financial institutions to accelerate their innovation and gradually evolve into an open banking model. The cross-border integration with Internet scenarios has led to improved Financial Technology (FinTech), creating unprecedented innovation opportunities for the banking industry.

The outbreak of COVID-19 and the emergence of new post-pandemic economic models will surely accelerate the intelligent transformation of financial institutions in terms of marketing, risk control, services, and operational efficiency.

As one of Huawei's important ecosystem partners, Sunline was invited to join the Big Data Industry Promotion Team of *Huawei's Kunpeng Intelligent Data Alliance* in 2019. Both parties are committed to jointly building converged, intelligent, and open data infrastructure, promoting the innovation and development of the big data industry, and driving the transformation of the digital economy and its intelligent upgrade.

Indeed, Sunline and Huawei have already cooperated on multiple successful cases based on FusionInsight HD, and in 2019, the two enterprises deepened their cooperation at multiple levels. Based on Huawei's Kunpeng ecosystem, Sunline carried out several tests and innovated solutions such as a converged financial data lake, core banking service systems, and core Internet systems, meeting the development needs of the financial industry regarding security control and digital transformation.

## Efficient and Agile Architecture Helps Banks Develop Core Strengths

In the post-pandemic new economic era, banks must improve their pure online financial services, and build an open, secure, and inclusive commercial bank model if they are to prevail amid increasing competition. Put simply, technology-enabled transformation and upgrades are now imperative for banks. Because core systems are key to a bank's overall core strengths, banks have very strict demands when choosing partners to help them build core systems.

As one of China's leading FinTech companies, Sunline has been dedicated to using self-developed technologies and products to deliver Chinese-made IT systems for financial enterprises nationwide for 18 years. Sunline builds enterprise-level architecture and core banking systems that support open platforms, micro-service architecture, and unit-based architecture design. With the ability to process hundreds of millions of users and transactions per day, these systems help customers implement digital construction focused on transformation development, improving efficiency and quality, and meeting customer requirements.

Technical platforms such as Sunline's are the most important underlying technical architecture of a core banking system, serving as the technical foundation for a new generation of core banking systems and determining the support capability of the system in terms of service development. Sunline's platform uses advanced unit-based distributed architecture and micro-service architecture to enable each unit to work



*Sunline Technology has always adhered to the principles of openness, sharing, and maintaining a global vision. In the future, Sunline will continue to work with Huawei to promote industry innovation and build a digital ecosystem, to spread China's leading financial technology capabilities to financial and pan-financial institutions worldwide, accelerating the global financial industry's digital transformation.*

*— Li Jinsong, President of Sunline Technology*

independently and with autonomy. The platform also supports flexible scaling based on micro-services. In addition, the standard deployment unit of unit-based architecture supports horizontal capacity expansion, achieving infinitely scalable architecture, easily meeting the massive transaction and data requirements of banking services. Such advanced technical architecture effectively satisfies all the digital service transformation requirements of banks.

For the banking industry to digitally transform, a comprehensive global solution is needed, and efficient and agile digital operations need to cover the entire banking services process, from production and assembly to sales.

Building an agile technical platform is therefore key to transformation, improving the full process efficiency of the IT system across all phases, from planning requirements and development, to testing, release, and Operations and Maintenance (O&M). Industry players need to use distributed policies to improve operational performance and enhance platform flexibility based on a micro-service framework.

Further, the banking industry must abstract the service themes of digital banking operations and build a service-driven, micro-service capability application center to greatly reduce system coupling and provide platform-based service capabilities for banking operations.

Other important actions include accelerating the

construction of an intelligent data middle platform, and improving the efficiency and intelligence of digital banking data applications.

Finally, banks and financial institutions need to build a digital service and scenario assembly center and a sales center to achieve high reusability and replicability of micro-service capabilities.

With mobile Internet, big data, and Artificial Intelligence (AI) technologies rapidly developing, banks in China have already begun to proactively transform themselves, hoping to promote online and intelligent services through digital transformation. With a full understanding of banking IT systems and service requirements, Sunline applies technologies to enable banking services, as well as innovating new technologies based on actual service scenarios, helping banks move to a new development path that gives equal priority to “customer operations” and “value operations,” accelerating the arrival of the digital era for commercial banks.

**Distributed core systems of banks based on the Kunpeng ecosystem:** A distributed core system is an important foundation for improving the security and controllability of banking IT systems. As an integrated software and hardware system, Kunpeng's distributed core system consists of an operating system, database, server, network, and storage products from Huawei. With GaussDB and Kunpeng servers



*Sunline has developed a data platform solution based on financial service logic and IT architecture. The solution covers the collection, storage and computing, service, application, asset management, and development and O&M of data. >>*

at its core, the distributed core system is a complete solution that integrates Sunline Technology's core banking application solutions. As well as high availability, the core system also supports high scalability, strong data consistency, automated O&M, and risk control. It consists of software, hardware, and databases — all made domestically by Chinese vendors, filling a gap in the field.

**Internet finance platform and Kunpeng solutions integration platform:** This converged platform integrates the Internet finance platform of Sunline and Huawei's Kunpeng software and hardware solutions. Featuring standardization, and high availability and performance, it supports the distributed deployment of applications and databases, micro-service-based development and deployment, and rapid horizontal expansion, facilitating quick iteration in Development and Operations (DevOps).

### **Enabling the Digital Transformation of Financial Enterprises Through Data**

Financial institutions have now entered the End-to-End (E2E) digital transformation phase, which covers channels, transactions, and analysis. Data has become the core asset of enterprises, directly enabling business success. Multi-dimensional convergent analysis — from data access and integration, to real-time risk control and quick decision-making — can improve the accuracy of customer profiling, enhance differential service capabilities, and reduce customer acquisition costs. Such analysis also supports the optimization of traditional services and the innovation of digital services, greatly improving the overall operational efficiency and risk control capability of enterprises.

The financial industry needs vertical full-

stack data processing capabilities to meet the requirements of massive amounts of data in all scenarios. In addition, the convergence and streamlining of horizontal scenarios can break data silos and eliminate the digital barriers erected by silo-like construction. Major commercial banks and financial institutions have built complete data warehouses. However, most of the data in data warehouses can only be used through reports, flexible query, or mining models. The issue of last-mile access severely compromises the data's value. But a data middle platform can effectively address this problem, helping banks fully mine their data assets to extract data value more efficiently and economically, in all scenarios.

Indeed, a data middle platform has become a strategic support for service sharing and business innovation, connecting front-end businesses and back-end technologies. Based on years of banking IT service experience and its R&D strengths, Sunline is dedicated to planning data platform architecture and building a data lake for financial institutions, as well as maximizing data value through data service platforms and data asset management platforms. Sunline has developed a data platform solution based on financial service logic and IT architecture. The solution covers the collection, storage and computing, service, application, asset management, and development and O&M of data. The solution supports data accumulation and can quickly respond to requirements and reuse data capabilities, maximizing the value of data assets. This means that the solution can help customers reuse enterprise data services, avoid repetitive construction, lower the cost of siloed collaboration, reduce the workload of the front-end based on common service capabilities,

unify service interfaces to improve operational efficiency, and boost the efficiency of both enterprise management and product innovation.

Supported by Huawei's Kunpeng software and hardware platform, Sunline aims to provide an overall solution for data planning, aggregation, management, computing, and application in the financial industry, to help bank customers build big data capability centers and explore data value in the various fields of risk control and marketing. Finally, Sunline is able to deliver a comprehensive, E2E converged data lake solution. This solution uses Huawei's GaussDB 200 data warehouse software and TaiShan servers to implement integration from the underlying infrastructure to the data application architecture. The solution also provides comprehensive data warehouse migration products, data warehouse development products, scheduling and Extract-Transform-Load (ETL) products, data visualization products, data services, and precision marketing and risk control products.

### **Driving Global FinTech Transformation Together**

The direction of development for global FinTech has significantly changed since the outbreak of COVID-19. Restricted by the insufficient scalability of traditional core and platform technologies, most financial institutions around the world struggled to cope with the massive surge in transactions (over a relatively short time period), and proved similarly unable to handle the management of corresponding service processes. However, after years spent reforming its FinTech, China's financial companies have managed to overtake counterparts around the world — in terms of

customer base, scenario diversity, transaction quantity, and technological innovation — and in the process have become an important driving force for the development of FinTech worldwide. As a leading Chinese FinTech company, and further encouraged by China's *Belt and Road Initiative (BRI)*, Sunline is working with Huawei to provide an integrated FinTech solution for customers, exporting China's successful and advanced models, services, and technologies to international customers, to help them improve both technological innovation and open capabilities, accelerating their digital transformation.

With many years of experience in the FinTech field, Sunline Technology has provided IT solutions for more than 700 financial institutions worldwide. Four years ago, Sunline began to explore the market in BRI regions, establishing dedicated overseas pre-sales and delivery teams. Sunline has already set up service sites in Singapore, Malaysia, Thailand, Indonesia, and the Hong Kong SAR (China), with the aim of gaining deeper understanding of these markets. Similarly, Huawei has unique advantages when it comes to implementing financial IT projects at a local level for international customers.

Sunline always takes a global view as it stays true to its principles of openness and sharing. Along with empowering Chinese financial enterprises through technology, helping them explore overseas markets, Sunline will collaborate with Huawei at a deeper level to promote industry innovation and build a digital ecosystem. Together, the two companies will share industry-leading Chinese FinTech with global financial and pan-financial customers, helping the global finance industry go digital. ▲



*China's financial companies have managed to overtake counterparts around the world — in terms of customer base, scenario diversity, transaction quantity, and technological innovation — and in the process have become an important driving force for the development of FinTech worldwide.*

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# Huawei and Jet Infosystems Take on Tough IT Industry Challenges

By *The Press Center of Jet Infosystems*

Like many great relationships, the partnership between Jet Infosystems — a leading Russian ICT company — and Huawei was forged through adversity. In fact, the bond between us formed incredibly quickly, as soon as we began working together in 2012, on a complex project to create a resilient infrastructure for the Russian National Payment Card System (NSPK).

The market reacted skeptically, because many industry insiders didn't believe we could complete the project within six months. Adding to this uncertainty, Huawei was a new and completely unknown vendor to the Russian market. Yet, despite doubting industry voices, one of our core principles — to always tackle the most difficult cases — proved to be visionary.

## Taking on Tough Challenges

We knew it was a huge challenge to create a nationwide, disaster-resilient IT infrastructure for the country's first national card payment system from scratch, but we immediately

started taking the necessary steps. We chose Huawei as our supplier. For the two data centers required, we tested solutions and ran simulations for the design, delivery, installation, and commissioning of the IT infrastructure that were needed — all using products that were completely unknown to the Russian market.

Difficulties that would have, perhaps, deterred others helped to create a bond between Jet Infosystems and Huawei, motivated us both to fight for the project — against the odds. This was perhaps best illustrated by Huawei breaking from traditional market practices and using their own funds and



*Looking to the future, we have ambitious joint projects with customers from some of the top 10 Russian companies and are planning the implementation of large-scale solutions in the IT market. As we take on these challenges and many more, we are determined to forge ahead with Huawei.*

specialists to assist us.

Huawei allocated the processors required directly from its reserves. In truth, this was instrumental to the project's success — standard delivery times from another vendor would have made it impossible to implement the project within the customer's specified deadline. Similarly, when critical network configuration problems arose, Huawei seconded approximately 20 of its own employees to help directly with the urgent development of a new patch.

It was this kind of focus and dedication that allowed us to deliver the project on time. And, on its completion, we realized that when working together with Huawei, we could massively broaden the scope of what we could achieve. Crucially, they had been with us every step of the way. This is why we have deepened our relationship every year since.

### **An Ever-Evolving Partnership**

In the eight years since that first project, our collaboration has evolved into a close working relationship, and we have become strategic partners in the Russian market, consistently providing outstanding results. Indeed, Jet has attained the highest level of partner status and is officially a Huawei Value Added Partner (VAP). Furthermore, Jet was the first company in Russia to receive the highest level of IT (storage and cloud) and IP (Internal Protocol network) equipment service status from Huawei, becoming a 5-star Certified Service Partner (CSP 5-stars).

During our years of cooperation, Huawei has helped us replace several generations of equipment. Together, we have completed hundreds of buildings, modernizations, IT replacements, and network infrastructure support projects for

customers from the financial, industrial, and transportation sectors, among others. Jet is proud to have won several prestigious awards for 'professionalism and expertise' from Huawei, and has been further honored as the Best Medium and Small Business Sales Partner. Meanwhile, several of our experts have received the highest level of technical certification — Huawei Certified Specialist (HCS) — in the storage systems and network solutions fields.

### **Modernizing IT Infrastructure at Jet and Beyond**

In 2018, we embarked on a major project: the modernization of our own IT infrastructure. Implementing it, we proved that seamless workflow transition into new technological solutions is possible. The project involved a series of large-scale internal IT projects, the creation of an additional data center, the transfer of all systems to a private cloud, migration to new campuses and Wi-Fi networks, and the implementation of a unified communications system.

The project was very challenging, and Huawei, once again, proved that it builds processes better than its competitors can. Huawei's Research and Development department works extremely efficiently, and any issues that do arise — regardless of difficulty, geographical distance, or time difference — are commonly processed within two days. That is one of the reasons why the Russian market has sat up and taken notice — and as a result, we've opened a special zone in Huawei's Russian office to demonstrate success cases that we have jointly implemented.

"Now, having the project implemented in our own company as a success story, we have refined the technological infrastructure, with everything specialized and segmented,

Huawei and Jet Infosystems take on the toughest challenges together in Russia

< 6  
months

to create IT infrastructure for Russian's first national card payment system

> 10,000

employees of Russia's third-largest bank transitioned to VDI

< 2  
days

to process any modernization issues occurring in Jet Infosystems' own IT infrastructure

so that we can quickly 'mirror' the solution for any customer with the necessary adjustments, thus reducing the time of any implementations," said Sergey Andronov, Director of the Jet Infosystems Network Solutions Center.

There are several large client projects in our portfolio that use Huawei's software and hardware solutions. There are projects involving the construction, modernization, and adaptation of branched networks according to the needs of specific organizations. There are other projects focusing on the creation of, and IT support for, complex and distributed infrastructure solutions across the country, for example: transitioning more than 10,000 employees of the third-largest bank in Russia over to Virtual Desktop Infrastructure (VDI); or migrating airport express railway operator Aeroexpress to the SAP HANA database management system.

We value Huawei's ability to respond promptly and efficiently to all customer needs, as well as the near-instant availability of new products for early testing and promotion — proof of the absolute trust between Jet and

Huawei. This was the case with the OceanStor Dorado 3000 all-flash storage system, as well as the new version of the second-generation TaiShan ARM-based server, both of which were adopted early by some customers, even before sales had officially begun.

But perhaps one of Huawei's biggest strengths is that it keeps current with the times and doesn't burden clients with old technologies. And it quickly eliminates software backlogs, so it competes on an open basis. The Russian market appreciates such fair play, and Huawei's market share is, as a result, continuing to grow. As well as having a massive market share in network products and storage systems, Huawei is among the top five vendors in Russia's server and storage IT markets; it has also recently joined the growing all-flash array market.

Looking to the future, we have ambitious joint projects with customers from some of the top 10 Russian companies and are planning the implementation of large-scale solutions in the IT market. As we take on these challenges and many more, we are determined to forge ahead with Huawei. ▲

### Partner Testimonials



"We realized that together with Huawei we can do anything. Moreover, they are together with us. That is why we are exponentially intensifying our interaction every year, carrying the key message as a banner: Huawei is not just a producer, but also a highly efficient and well-developed company that grows at a rapid-fire pace. Our close cooperation is a chance for companies across the country to see the opportunities that Huawei offers. Any project using Huawei equipment not only receives financial benefits and convenience from working with the most powerful IT-complexes, but also long-term investment in the Russian IT market, and an intellectual contribution to the digitalization of the country's economy."

— Vladimir Eliseev, CEO of Jet Infosystems



HUAWEI

**700+ CITIES  
ALL OVER  
THE WORLD  
DIGITALLY  
TRANSFORM  
WITH HUAWEI.**

**TOGETHER**

Building a Fully Connected, Intelligent World



# TOGETHER

**253**  
**FORTUNE GLOBAL**  
**500 COMPANIES**  
**DIGITALLY TRANSFORM**  
**WITH HUAWEI.**

Building a Fully Connected, Intelligent World.