

# ICT INSIGHTS

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**LEADING NEW ICT**

*Eric Xu, Rotating Chairman of Huawei*

## Blazing a Trail for Intelligent Cities

*Yan Lida, President of Huawei Enterprise Business Group*

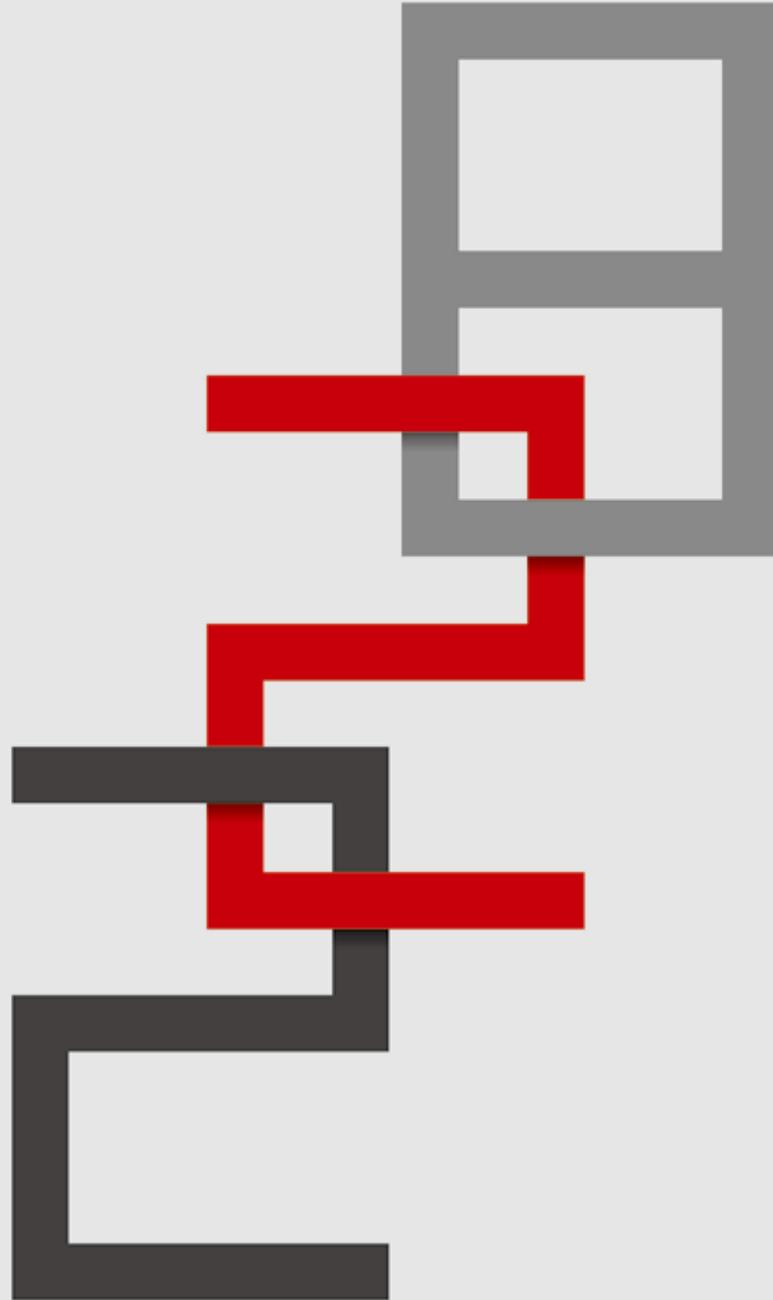
## Intelligent Cities Enable the Digital Economy and Drive Growth



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# Blazing a Trail for Intelligent Cities: Building a Digital Foundation and Integrating Apps

By Eric Xu, Rotating Chairman, Huawei Technologies Co., Ltd.



**A**t Huawei, we envision a fully connected, intelligent world. Intelligent Cities — in which all citizens, homes, and organizations are connected — are a key step toward building this intelligent world. To make Intelligent Cities a reality, Huawei takes a two-pronged approach: first creating a digital foundation that delivers ubiquitous connectivity, digital platforms, and pervasive intelligence; then integrating applications from leading industry partners. By doing so, we aim to start a new chapter for Intelligent Cities.

## Three Dimensions for Consideration During the Development of New Intelligent Cities

Based on our experience in more than 200 Intelligent City projects around the world, Huawei believes that the following three dimensions should be priorities when beginning a new Intelligent City project.

### • First Dimension: City Administration

First and foremost, a new Intelligent City needs to focus on the issues arising from urbanization, such as traffic congestion, pollution, risk prevention, and safety. Achieving targeted and efficient urban governance and administration should be the first priority of any Intelligent City.

Intelligent Cities should also prioritize fostering new businesses and industries, and integrating new Information and Communications Technology (ICT) and Artificial Intelligence (AI) technologies into traditional industries. The idea here is to create new momentum for industry development.

Intelligent Cities also need to adopt new technologies that create completely new experiences to improve the lives of all citizens.

### • Second Dimension: City Transformation

New Intelligent City development requires changes on multiple fronts:

- Siloed, fragmented technologies must give way to platforms and ecosystems;
- Government-led investment must evolve into multi-stakeholder investment such as Public-Private Partnerships (PPPs);
- Distributed Operations & Maintenance (O&M)

will be superseded by centralized and intelligent operations.

These new models are set to generate endless economic benefits for cities, paving the way for the sustainable evolution of Intelligent Cities.

### • Third Dimension: Path and Pace of City Development

Every project has both short-term and long-term objectives. Fundamentally, an Intelligent City project should start with short-term priorities: namely, the most pressing needs of its citizens. Huawei recommends a phased or stepped approach that first focuses on dealing with less complicated issues, before moving on to address more difficult challenges. For an Intelligent City to follow this path and pace of development, its technology platform needs to have iterative and scalable AI capabilities.

## Three Pillars of New Intelligent Cities

An Intelligent City relies on three pillars: a digital foundation, an open platform, and innovative business models. Meticulous planning must go into all three if we hope to turn Intelligent Cities into a reality.

### • A Powerful Digital Foundation that Integrates Cloud, AI, and IoT

- Eliminate technology silos and integrate services that were once scattered here and there, so that everything can be connected;
- Facilitate data collection, pool data from all



*Intelligent Cities will bring enormous opportunities to improve governance, benefit citizens, and help industry to prosper. Huawei is committed to blazing a trail for Intelligent Cities by building a digital foundation that features ubiquitous connectivity, digital platforms, and pervasive intelligence. Working closely with partners, Huawei delivers innovative Intelligent City technologies to create new momentum for digital economies in an intelligent world. >>*



sources, and support data mining, analytics, and sharing to provide inputs for an Intelligent City's "digital brain";

- Support a wide array of applications, which provide technological means for city administrators to achieve easy, accurate, and efficient governance and decision-making.

The digital foundation is like a plot of fertile soil in which digital economies can take root. On top of this digital foundation, Huawei brings industry partners and applications together to empower all industries as they digitally transform and seek further growth.

- **An Open Platform that Combines a Full Set of Capabilities Required by an Intelligent City**

In the past, the traditional approach to Intelligent City development was to roll out individual ICT projects that targeted specific fields. A more effective approach is to build an open digital platform that aggregates the capabilities of all ecosystem players. This new approach will turn Intelligent Cities into a new enabler of industry development.

An open platform such as this offers a full set of capabilities — including big data, AI, video, Geographic Information System (GIS), and converged communications — to a diverse range of applications. The platform also integrates all types of city status data to inform decision-making.

The benefits created by this open platform are enormous. It supports all sorts of Intelligent City applications across sectors, from agriculture and healthcare to education and transportation. The experience gained by a city as it becomes smart will be useful for fostering new industries and new capabilities.

In addition, the platform can open up its capabilities and data to businesses and organizations, who can use them to drive Intelligent City development and create new value. This multi-stakeholder model will also incubate new businesses and industries, and spur the transformation of traditional industries, ultimately creating new momentum driving the digital economy forward.

- **Innovative Business Models that Support Sustainable Operations of Intelligent Cities**

At present, government-led investment and PPP are major models for Intelligent City development. As an Intelligent City gradually matures — with ubiquitous connectivity, the continuing aggregation of massive amounts of data, and the growing value of device connections and data — its momentum will be sustained by new business models that will emerge to extract greater value from Intelligent City operations, rather than from

new investments. As such, new value-added operating solutions will ensure sustainable Intelligent City development. An example is an operating solution that reduces the vacancy rate of urban parking lots. By resolving a persistent problem that citizens face, this type of solution increases the use of urban resources and thus creates huge economic gains for the city.

### **Facilitating Intelligent City Development for a Better Future**

To date, Huawei — working closely with leading partners — has played a meaningful role in more than 200 Intelligent City projects across more than 40 countries, with outstanding results. Highlights include:

- Intelligent City in Rustenburg, South Africa
- Intelligent City for Bonifacio Global City, the Philippines
- Smart and digital Sardegna, Italy
- Top-level design for Intelligent Cities in Guangdong and Shanghai, China
- Big data modeling in Guizhou, China
- Smart traffic control in Longgang District, Shenzhen, China
- Smart rice cultivation in Chengyang District, Qingdao, China
- AI capability center in Binhai District, Tianjin, China
- City-wide IoT network in Yingtan, Jiangxi Province, China

Initiatives that focus on digital economies, industry transformation, and building an intelligent world have captured the global imagination. The wave of digitization is sweeping the world. Huawei aims to speed up the transition to digitization and AI, and blaze a trail for Intelligent Cities, which we believe will offer vast potential to improve governance, benefit residents, and promote industry prosperity.

To this end, Huawei will build a digital foundation featuring ubiquitous connectivity, digital platforms, and pervasive intelligence. We will also establish open ecosystems in which we can work with our partners for shared success. Cooperating with our partners, Huawei delivers innovative Intelligent City technologies to create new momentum for digital economies in an intelligent world. ▲

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Working closely with partners, Huawei delivers innovative Intelligent City technologies to create new momentum for digital economies in an intelligent world. >>

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Huawei Horizon Digital Platform derives its value not from its software or hardware, but from its ability to integrate new ICT capabilities, empowering all Intelligent City applications. >>

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To be an informative and inspiring magazine, ICT Insights needs your continual contributions and feedback. Please feel free to submit articles for publication. The editors greatly value your input.

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## Expert Opinions on Smart Cities

# How Can We Develop High Quality Smart Cities in the Digital Era?

Prepared by Zhao Zhijuan, Smart City Solution Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

**Yang Xueshan, Former Vice Minister of Industry and Information Part-Time Professor at Peking University**  
Former Vice Minister of the Ministry of Industry and Information Technology, Yang retired in February 2015. Yang's research fields include Chinese character information processing, information system and network design and development, information economics, information law science and national informatization development strategy. Since 1981, Yang has published more than 150 academic theses.

**Shan Zhiguang, Director of the Information and Industry Development Department of the State Information Center, Director of the Smart City Development Research Center**  
Shan is a national candidate for the New Century Talent Project, a member of the Beijing Informatization Advisory Committee, and Secretary General of the Smart City Development Research Center of China. Shan's research areas include ICT strategic planning and development policies, as well as overall Smart City planning and top-level design.

**Zhang Guohua, Director of the Urban Center Integrated Transportation Planning Institute of the National Development and Reform Commission**  
Zhang has a doctor's degree and is a professor and senior planner. His research focuses on new urbanization fields, such as the new collaborative planning technology system of industry, space, and transportation, new space economic theory and new system economic theory based on transportation, development planning of the multi-level rail transportation system, and Smart City planning.

**T**he digital economy is growing rapidly. According to *Huawei's 2018 Global Connectivity Index (GCI)* study, the growth rate of the global digital economy in the past 15 years is 2.5 times that of the global Gross Domestic Product (GDP). As the Industrial Internet develops, and various industries are integrated with digital and smart processes, it is estimated that the global digital economy will account for 24.3 percent of the world's GDP by the end of 2025.



Yang Xueshan, Former  
Vice Minister of Industry and  
Information, Part-Time Professor  
at Peking University

In the future, the digital economy will be the main driving force for economic development. Therefore, measuring the output and benefits of the digital economy is crucial. In the next 10 years, all industries and countries will be concerned with seizing the opportunities provided by the digital economy to maximize their growth.

City development is the epitome of social progress in a country. A Smart City's construction can serve as an important carrier for developing the digital economy in a country, while also integrating the digital economy with physical industries, allowing us to better measure the output and benefits of the digital economy.

***Why is the digital economy considered a reconstruction of productivity? How can we measure its role in economic development?***

**Yang Xueshan:** With changes to traditional production models, the digital economy has become more prominent. Digital technology, as a new factor of production, shares similarities (while also having differences) with traditional production factors, such as capital and management. It is important to remember that digital technology must be combined with specific economic activities before it can create value. However, this is also true of other production factors. The difference is that the adoption of digital technologies brings a whole new field — that is, the information field — providing

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**“Industry digitization is the all-around, all-perspective, and full-chain transformation of traditional industries using information technologies. For all economic sectors, the shift from quantitative growth to qualitative upgrade happens as a result of industry digitization. Industry digitization will be key to future development.”**

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a new foundation for the optimization of economic activities and processes.

The measurement of the digital economy, whether by international or Chinese organizations, is generally performed from the macroeconomic perspective. According to the Organization for Economic Cooperation and Development (OECD) and the United Nations Commission on International Trade Law (UNCITRAL), the digital economy accounts for about 6 percent of China's total GDP. However, according to the China Academy of Information and Communications Technology (CAICT), China's digital economy accounted for 32.9 percent of its total GDP in 2017. Why is there such a big gap between the two figures?

Actually, the digital economy consists of two parts: the core part of Information and Communications Technology (ICT), and the extended part, also called the convergence part. In terms of the core part, every country has its own strict measurement indicators, but there are currently no indicators for gauging the convergence part. The statistics previously mentioned, from the OECD and UNCTAD, contain only the core part, while the CAICT contains both parts in their review — therein lies the problem.

This explains why the CAICT has proposed two concepts, namely digital industrialization and industry digitization. Digital industrialization refers to the



Shan Zhiguang, Director of the Information and Industry Development Department of the State Information Center, Director of the Smart City Development Research Center

market-oriented application of Information Technologies (IT), including Internet-based software, hardware, and information services, accounting for less than 5 percent of China's GDP; while industry digitization is the all-around, all-perspective, full-chain transformation of traditional industries using advanced information technologies. The latter accounts for more than 25 percent of China's GDP, and more than 50 percent of the GDP in the US. A city's development will be centered entirely on industry digitization.

**Shan Zhiguang:** When restructuring productivity in a digital economy, productivity development is essential to drive social and economic transformation. In an agricultural or industrial society, it is labor and capital that are the main production factors, respectively. But in the digital age, it is data that is the major production factor. With that being said, I don't think data's significance has impacted productivity yet. Neither has digital technology become a true force in modern economies, at least not as dominant as capital and labor in the industrial and agricultural ages, but the trend is still very clear. Indeed, data is becoming an invaluable resource, however, how these resources become assets and how these assets become capital is still unclear. Currently, we are trying to find a good model to address these challenges.

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**“Building an effective evaluation system is critical to guiding and promoting a Smart City's development. However, a Smart City's assessment is still at the superficial and technical level, and fails to address the fundamental issue of improving city management and governance.”**

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***Smart City construction is crucial to developing a digital economy. As such, what are the challenges faced when constructing a Smart City?***

**Yang Xueshan:** In China, currently, the biggest challenge facing Smart City construction is not the country's social and economic development — which is being transformed at a rapid pace — rather it is the challenge of transforming people's mindsets to keep up with the country's Smart City development.

Let's look at two reports as examples. Firstly, the *China Artificial Intelligence (AI) Industry Index 2018*, released by the Cheung Kong Graduate School of Business, found that there were more than 400 active enterprises in the AI sector in China during 2016. By 2018, most of these enterprises had disappeared. According to another report, out of more than 800 surveyed enterprises that emerged before 2016 in China, most of these enterprises — related to AI, big data, Industrial Internet, Internet of Things (IoT), and blockchain — have now vanished. We need to ask the question, why are these enterprises disappearing so suddenly? There must be something wrong with our mindset. We need to explore the reasons from the perspective of network, data and intelligence.

In regards to the Internet, Metcalfe's Law states that the more nodes the network has, the more value it creates. However, this rule does not apply in the IoT field, as IoT



Zhang Guohua, Director of the Urban Center Comprehensive Transportation Planning Institute of the National Development and Reform Commission

nodes are mostly passive. Any additional nodes or information are a waste. As such, the Internet and IoT can be considered quite different. Although many people have tried to neglect the differences between the two, and apply Internet models to the development of IoT, they have all suffered the same fate — failure.

Many people, instead, regard data as king. During Smart City construction, city data is aggregated. But what happens after data aggregation? Unfortunately, Smart City planners have placed too much emphasis on managing the enormous amount of data we gather, but not actually on how we can use the data to benefit a city's residents. The concept of big data leads many people into thinking that large amounts of data inherently bring productivity and value. However, this is wrong because data, as a production factor, must be used in specific economic activities to create value.

And finally, in terms of intelligence, almost everyone equates algorithms and data to AI, but this is wrong. There have been countless AI enterprises in China that have disappeared in the past three years, and all were led by world-class algorithm scientists. These enterprises had all conducted deep neural networking as well as machine learning research, based on multiple algorithms and open datasets. Yet, these enterprises have all disappeared. Why did they fail? Because data research alone cannot solve real world problems. AI needs

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**“How can we learn from the world’s most advanced Smart City development model and carve out a high-quality development path based on China’s actual conditions? The answer lies in properly handling the relationship between the past and the future, and that between the government and the market.”**

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to be used to solve real world problems, including improving the management processes of those in the government, manufacturing, and medical sectors. And when constructing Smart Cities, we need to answer the same question: What role can smart applications play in the development of cities in the next three, five, or even ten years?

**Shan Zhiguang:** Enabled by alternative technologies, Smart Cities represent a new model for urban areas. The development of Smart Cities must keep pace with the development of society. The fundamental problem is deciding whether Smart City solutions are synchronized with a city’s economic or social development. Today, Smart City assessment is being performed at a superficial level, and this is a problem. The solutions should not be too futuristic, nor should they lag behind the times. However, we often forget that Smart City solutions are scenario-based, and cannot be applied to all peoples and all economies around the world. A Smart City’s management is of the utmost importance.

When constructing a Smart City, the ultimate goal is to improve city management and governance. To achieve these goals, it is simple — a city’s management must improve. Therefore, Smart City construction is not only about the informatization of cities, but also the smartification of city development models. Currently, Smart Cities are assessed in



***In current Smart City models, a city's operations are its biggest weakness. In the future, Smart Cities will be application-oriented, and the industry ecosystem will be focused on Software as a Service. A city's operations will be key to building a successful Smart City. >>***

terms of the technology used: devices, networks and cloud. However, this appraisal does not include the fundamental changes that are necessary to the successful construction of a Smart City. As such, these rigid technical evaluation indicators are obstructing Smart City development.

Furthermore, cities are the epitome of social progress. A Smart City should be a means of social progress, and should be oriented toward social progress. In the past, Smart City construction has focused on urbanized areas rather than rural counties and townships, widening the economic gap between urban and rural areas. In the future, more attention should be placed on ensuring an entire city is developed equally, and neither urban, nor rural areas, are left behind.

Although Smart City construction currently faces multiple challenges, I am optimistic about its future. There have been positive achievements recently that are very encouraging, and there are signs of intelligent social development in China. Many cities in China are showing signs of intelligence in their development and governance. A number of authentic Smart Cities can be expected in the next three to five years.

***Do you have any suggestions to improve Smart City development models in the future, or for participants in Smart City construction?***

**Zhang Guohua:** There are two relationships that matter when building Smart Cities: the relationship between the past and future; and the relationship between the government and market. In regards to the past and future, let's think about the traffic control centers in Chinese cities — they are some of the most advanced in the world. However, we are yet to see considerable improvement in these cities. Why? Because in the past, the government focused on a Smart City's economic benefits — revenue from taxes and fines — rather than

the benefits a Smart City can provide to its citizens. In the future, Smart City construction should return to its goal of improving people's lives.

The other relationship is between the government and the market. What is considered an appropriate division of labor between the government and market? What should be done by the government and what should be left to the market to decide? We need to learn from the leading Smart Cities around the world, and avoid making similar mistakes. In my opinion, the most successful Smart City projects have adopted the UK's development model. Its model proves that the role of the government is weakening, and that many Smart City problems can be addressed by the market. The UK's model needs to be studied, understood, and then adapted after considering China's own challenges.

**Shan Zhiguang:** In current Smart City models, a city's operations are its biggest weakness. In the future, Smart Cities will be application-oriented, and the industry ecosystem will be focused on Software as a Service (SaaS). A city's operations will be key to building a successful Smart City. I believe a city- or social-level operations service industry will emerge in the future, and may replace Baidu, Alibaba, and Tencent, becoming a leader in the next-generation new economy. As such, the relationship between the government and an enterprise will have to evolve. What role should enterprises play in a Smart City's development? I think enterprises should adopt a long-sighted mindset and establish long-term, sustainable cooperation with the government. Enterprises need to be future-oriented in order to keep pace with the times. ▲

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*(This article was prepared based on the discussion on the topic of Digital Economy Drives the Development of Smart Cities at the 2019 Smart City Salon in Beijing.)*

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# Smart Cities: Building a People-Centric World

By Mao Huidong, Director of the Greater China Region, SCEWC Committee, and CEO of the Greater China Region, SCEWC

People are entirely responsible for urban development, but they are also the root of all the challenges during its process. Urbanization, alongside the aggregation and circulation of urban populations, promotes the development of civilization, commerce, and technology. Moreover, urban populations — those with high population densities and infrastructure — put pressure on urban management, social resources, and the cost of living, all of which cause urban development issues. To address these challenges, among others, Smart City projects are being established with the ultimate goal of using digital technology to create safer, more efficient cities — and a smarter world.

Using Information and Communications Technology (ICT), city managers can identify existing or emerging problems through effective analysis and use of city data, and collaborate with partners from different fields to formulate prevention plans and solutions, while improving service levels as well as the quality of life. Simply put, technologies drive urban development and benefit people's lives.

As SCEWC CEO Ugo Valenti said at the *Shenzhen Smart City Forum with International Friendship Cities*, “innovative technologies, including 5G, IoT, AI, and cloud, are disruptively renovating how cities are governed and managed. By nurturing Public-Private-People Partnerships, a co-creation model among government, corporations, and citizens, Smart Cities will facilitate a more open decision-making process, and bring a people-centric new world.”

Different cities from around the world have distinctive

construction ideas, all of which are people-centric. Three different Smart City construction cases are presented below.

## **New York (Winner of the 2016 World Smart City Award): Building a Smart and Equitable City**

In September 2015, New York City named its Smart City development strategy “*building a smart and equitable city*,” and made detailed plans for five sectors: smart building and infrastructure; smart transportation and mobility; smart energy and environment; smart public health and safety; and smart government and community. New York City's population — almost 8.6 million people — would all benefit from the proposed changes.

Since 2014, the New York City government has launched several projects to prepare for the subsequent strategy release.

- **LinkNYC:** In 2014, New York City initiated an ultra-high-speed

**“Innovative technologies, including 5G, IoT, AI, and cloud, are disruptively renovating how cities are governed and managed. By nurturing Public-Private-People Partnerships, a co-creation model among government, corporations, and citizens, Smart Cities will facilitate a more open decision-making process, and bring a people-centric new world.”**

Wi-Fi network project, with the aim of replacing traditional telephone booths across the city with 7,500 to 10,000 digital communication sites worth US\$200 million. New York City adopted an innovative cooperation model to provide financial support for this project. The sponsor — CityBridge (a funding alliance consisting of Quantum, CIVIQ, and Intersection) — was permitted by the government to provide funds for the installation of digital booths, and charge advertising fees for them. The profits will be shared between CityBridge and the New York City government at the agreed rate. This 12-year project is expected to generate US\$500 million in advertising revenue, covering the costs of device installation, maintenance, and digital advertising operations. In 2016, New York City raised US\$1 billion through the EB-5 visa program for the second phase of the LinkNYC project. Investment from major enterprises, such as Google and Qualcomm, also helped bankroll the project. There are more than 7,500 digital booths in New York City. Not only do they come with free Wi-Fi services, they also provide tourists with free services such as direction lookup, phone charging, and 911 emergency calling.

- **RLAB:** A project that aims to construct a 16,500 square-foot collaborative laboratory for the research, entrepreneurship, and education of Virtual Reality/Augmented Reality (VR/AR), space computing, and other emerging media technologies. This is the very first VR/AR center sponsored by a city government. The New York City Economic Development Corporation (NYCEDC) and the Mayor’s

Office of Media and Entertainment are going to invest US\$5.6 million in RLAB to get this project started. Applying VR/AR to city planning and policy may exert a positive influence on New York’s economy and other industries, including (but not limited to) the media, entertainment, real estate, education, tourism, finance, and medical care sectors.

- **Quantitative community:** In 2014, New York University’s Center for Urban Science and Progress (CUSP) worked with the Hudson Yards community to establish the US’s first ‘quantitative community.’ This project aims to construct a sophisticated service system for a 17-million-square-foot residential and business complex by 2020. The service system will include educational institutions, hotels, public areas, renewable energy power plants, and waste management systems, and will continuously optimize community construction and environments by monitoring and analyzing air quality, pedestrian foot traffic and vehicle traffic, energy production and consumption, and people’s health status.

- **Smart New York system:** In 2015, Manhattan built a comprehensive city control system based on public data. It supports two- and three-dimensional linkage control. The two-dimensional interface facilitates the selection by tap mode, while the three-dimensional interface is more comprehensive. The system integrates multiple types of data, such as geographical information, GPS data, three-dimensional building data, statistical data, and camera footage. By interconnecting all types of data from different government departments and aggregating them on a unified



***Dubai's Smart City strategy was initiated in 2014 with the aim to transform Dubai into the world's smartest city by 2021. In less than three years, beginning in 2014, Dubai's government departments had worked with partners in private sectors to initiate more than 100 smart projects and more than 1,000 smart services.***  
 >>

big data platform, the system can monitor and manage the city's overall operating status, such as public services, police services, firefighting, transportation, communications, and commerce.

- **IoT Blockchain Center of Excellence:** In 2017, WISeKey, a Swiss digital security and cybersecurity company, established an IoT blockchain in New York to provide a secure IoT model for performing daily tasks such as transmitting, processing, and storing data. This is to increase the security of IoT. MXC, a non-profit blockchain organization, announced in 2018 that it would cooperate with MatchX GMBH and Citesense to use the Mythware protocol in New York City's Smart City IoT Standards. Starting from 2019, MXC has deployed smart sensors and Low-Power WAN (LPWAN) gateways all over New York City to ensure reliable and effective data transmission.

Moreover, after releasing the Smart City development strategy and winning the *2016 World Smart City Award*, the New York City government launched a public data platform in 2017 — New York Public Data Portal — to support public and private organizations in using public data for Smart City projects, while benefiting related industries. New York City has also developed a real-time dashboard for the Mayor's Office to integrate numerous real-time city data for urban management, such as the city's traffic status, layout of traffic lights, and cleanliness of streets. This dashboard helps the mayor with decision-making, and makes it possible to provide high-quality government services to citizens.

**Dubai (Winner of the 2017 World Smart City Award): Creating a Seamless, Safe, and Efficient City Experience**

Dubai's Smart City strategy was initiated in 2014 with the aim to transform Dubai into the world's smartest city by 2021. Dubai established a Smart City office and launched the most ambitious ICT integration

plan ever. In less than three years, beginning in 2014, Dubai's government departments had worked with partners in private sectors to initiate more than 100 smart projects and more than 1,000 smart services. In addition, the government has developed a data-driven economy to help increase Dubai's GDP by 10.4 billion *dirham* (US\$2.93 billion) by 2021. Survey results have shown that these smart city projects have improved the well-being of Dubai citizens by 3 percent.

Dubai's Smart City construction involves the following projects: turning over 1,100 fundamental government services into online smart services; introducing self-driving cars and smart transportation services; providing free high-speed Wi-Fi for the entire United Arab Emirates (UAE); building an ultra-high-speed train (Hyperloop) that connects Dubai and Abu Dhabi; and formulating and releasing the local AI development strategy alongside the Dubai blockchain strategy.

The Dubai blockchain strategy is prioritized among all the development strategies. The Smart Dubai Office and Dubai Future Foundation jointly proposed this strategy by continuously exploring and evaluating the latest technological innovations. This strategy strives to transform Dubai into the first city in the world to be solely blockchain-powered by 2020. It will benefit 3.13 million Dubai residents, who will enjoy seamless, safe, and efficient city experiences. Moreover, the Dubai government will also benefit from the application of blockchain technologies. It is estimated that 5.5 billion *dirham* (US\$1.49 billion) will be saved annually in document processing alone.

The Dubai blockchain strategy is based on the three following key points:

- **Government efficiency:** Fully apply blockchain technologies to government services to achieve higher efficiency.
- **Industry creation:** Establish and enable the



*In 2017, Singapore invested US\$1.7 billion in the IT industry, and also increased its investment in sectors such as data, network security, and Smart Nation application to satisfy the needs for developing digital economy, eGovernment, and digital society. >>*

blockchain ecosystem for all enterprises, especially startups.

- **International leadership:** Guide the research of cross-border blockchain application cases, and direct blockchain pilot deployment.

In 2018, Dubai launched 20 blockchain service projects, including the following highlights:

- **Dubaipay** — the Dubai online payment portal — has used blockchain technologies to ensure the timeliness of online transaction settlement and reconciliation.

- In March 2018, Dubai's tourism management department announced plans to overhaul its online tourism system using blockchain and smart contract technology.

- **National Bank of Dubai** — Dubai's largest bank — launched a blockchain-based finance project in April 2018 to reduce check fraud.

- Dubai's transportation department has launched a blockchain-driven vehicle management system that allows users to trace the entire life cycle of their cars from production to recycling. Currently, this system is only available to Dubai citizens. It will be promoted across the entire UAE in the future, effectively gathering the information of all vehicles in the country.

### **Singapore (Winner of the 2018 World Smart City Award): Upgrading from Smart City to Smart Nation**

Singapore launched its 'Smart City 2015' plan back in 2006, which involved applying ICT to various aspects of daily life and economic development, such as digital media and entertainment, education and training, financial services, manufacturing and logistics, healthcare and bioscience, and eGovernment. This plan also contributed to the construction of next-generation national ICT infrastructure.

The Singapore Government announced its 'Smart Nation' plan in November 2014 and upgraded Smart City 2015 to Smart Nation 2025 to construct Asia's leading smart nation.

The Smart Nation plan focuses on the collection, processing, analysis, and application of big data, and includes the following measures:

- **Establish a technology agency:** In October 2016, the Singapore government established the Government Technology Agency (GovTech), to coordinate various public sectors, integrate and promote the government's digital technology strategy, and develop technologies such as IoT, big data analytics, geographical space technology, and AI. In terms of data collection and application, the 'Big Data SandBox' has been adopted to monitor the real-scenario application of technologies and gradually introduce mature technologies to society.

- **Build an Internet Data Center (IDC):** The key to the 'Big Data SandBox' is support from the cloud computing data center. Singapore built a 'data center park' using government planning and enterprises' self-built data centers, and launched the world's first tropical data center project, which uses natural wind and freshwater for cooling. The project was designed to promote the construction of a new data center.

- **Converge with global networks:** Singapore aims to benefit citizens with data and promote international interconnection at the same time. Singapore has now reached agreements with New York, San Jose, and San Francisco to give Singaporeans free access to local Wi-Fi. Similarly, US citizens can use wireless infrastructure when they are in Singapore.

- **'Hyperlink building':** Hyperlinked buildings can help digitize people's activities, and collect holographic and social data to provide reference for various responding measures.

In April 2017, Singapore appointed the Smart



*The promotion and application of 5G will enable new ICT such as cloud computing and IoT, and Smart City construction will step into a period of fast development. In the future, Smart Cities will evolve into Smart City clusters and Smart Nation — maybe even a smarter world. >>*

Nation Digital Government Group to lead the project to accelerate the development process of Smart Nation. Singapore invested US\$1.7 billion in the IT industry, and also increased its investment in sectors such as data, network security, and smart nation application to satisfy the needs for developing the digital economy, eGovernment, and digital society. Driven by IT and digital technologies, Singapore's Smart Nation construction has achieved the following outcomes:

- **Wireless Singapore:** Singapore now has 7,500 hot spots, equivalent to 10 public hot spots per square kilometer, covering the airport, CBDs, and shopping districts. It is expected that by 2020, all MRT lines, light rail routes, and bus transfer stops in Singapore will be covered by wireless networks.
- **Online public services:** 98 percent of public services can now be accessed online.
- **Intelligent transportation:** The MyTransport.SG app enables its users to search for information such as arrival time in real time. The Parking.SG app allows people to select parking lots, query parking fees, and check parking times.
- **Smart healthcare:** Singapore has established a comprehensive healthcare information platform that integrates the national electronic medical record system, comprehensive clinical management system, individual health record plan, and remote cooperation solicitation plan. By 2017, telemedicine videoconferencing medical consultation was being widely promoted. The Vidyomobile app has made it possible for people to seek medical treatment at home.
- **Smart education:** A tablet-assisted education model — featuring education-themed games and fun courses — was introduced alongside a 4D simulation laboratory, built to enable direct interaction between synchronous multi-touch screens and the 4D environment. This teaching mode has been widely

adopted in elementary schools.

- **Smart street lights:** In June 2018, the Singapore Land Transport Authority (LTA) announced its cooperation with Itron and Guangdong Rongwen Energy Technology Group to upgrade and transform the country's street lights. By adopting the IPv6 + MESH communication technology and using the stability, communication speed, reliability, security, and scalability of the central management system, the LTA is exchanging the existing 110,000 high voltage sodium lamps in Singapore for smart LED street lamps with a smart control system, reducing energy consumption and maintenance costs, while also improving operational efficiency, and achieving on-demand lighting.

### From Smart City to Smart World

The original Smart City was first proposed over 10 years ago. The *Smart City Expo World Congress (SCEWC) Committee* — as one of the leaders in the construction of the global Smart City ecosystem platform — is glad to see that more and more countries, regions, and organizations are becoming part of this revolutionary movement. The international community is now actively (and more effectively) exploring the ways to build Smart Cities instead of simply discussing whether Smart Cities shall be built. As such, expect the global construction of Smart City-related domains to increase, including eGovernment, smart society, smart transportation, and emergency response. Meanwhile, Smart City construction is bound to affect global cooperation in more profound ways, while promoting economic and scientific development.

The promotion and application of 5G will enable new ICT such as cloud computing and IoT, and Smart City construction will enter a period of fast development. In the future, Smart Cities will evolve into Smart City clusters and smart nations — maybe even a smarter world.▲

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# Intelligent Cities Enable the Digital Economy and Drive Growth

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

In the 21<sup>st</sup> century, the world has unprecedented development opportunities. For cities worldwide to capitalize on those opportunities, it is imperative to use new technologies to drive the development of the new economy.

## Digital Economy: The New Global Economic Development Model

The 2016 G20 summit — held in Hangzhou, China — proposed four initiatives for promoting innovative economic growth: innovation, a new industrial revolution, structural reform, and the digital economy.

Over the past few years, major economies around the world have reached consensus on the importance of digitization — the conversion of information and data into a computer readable format — and Information and Communications Technology (ICT). They agree that digitization has vast potential for promoting economic growth and prosperity, and ICT is indispensable in growing the digital economy.

### • ICT Investment Is Key to Digital Economic Development

In 2018, Oxford Economics and Huawei collaborated on a digital economy research project that analyzed the economic data of 79 countries and regions over the past 15 years and provided forecasts. The researchers learned that the growth rate of the digital economy in the past 15 years was 2.5 times the global GDP growth rate. Over a 10-year-period that started in 2015, the digital economy will be the main engine of global economic growth. In 2025, the digital economy will account for 24 percent of the global economy — a 9 percent increase from 2015.

The researchers also discovered that the long-term Return On Investment (ROI) in digital technologies is 6.7 times that in non-digital technologies. A one dollar investment in ICT

today would produce an average return of 20 dollars in 2025, while the average ROI for non-ICT investment of one dollar would only be worth three dollars by 2025. ICT investment plays a crucial role in driving economic development and has become a key engine behind economic growth.

### • Accelerating Transformation of the Digital Economy to Industry Digitization

The development of the digital economy is characterized by the accelerating transformation from the consumer Internet to industry digitization.

The consumer Internet era has been characterized by the ‘attention economy,’ which has used the demographic dividend of a rapidly-growing number of Internet users to deliver optimal experiences to consumers. The demographic dividend is now waning; the driving force of the consumer Internet is weakening, and the development of the digital economy is entering an industry digitization phase.

As the industry digitization era takes hold, the number of Internet of Things (IoT) connections will reach 100 billion by the end of 2025. With intelligent analysis and decision-making, the massive amounts of data generated by the hundreds of billions of connections will boost the productivity of traditional industries and bring many more benefits to society than the consumer Internet did. The scale of the digital economy will increase from US\$300 billion in the consumer Internet era to US\$23 trillion in the industry digitization era.



Huawei Horizon Digital Platform can coordinate various new ICT technologies and streamline different types of data. Cities can use the platform to lower the threshold for using new technologies and quickly integrate systems. Huawei Horizon Digital Platform has played an important role in the construction of Intelligent Cities around the world, paving the way for the digital transformation and smart construction of these cities.



### Developing the Digital Economy

#### • The Intelligent City Is the Foundation of the Digital Economy

With the prosperity of commerce and trade, the accumulation of knowledge, and the advancement of science and technology, cities are the focal points for economies. Since we entered the industrial era, industrial revolutions have driven the advance of science and technology as well as the development of cities, creating a huge amount of talent and funds that fuel technological revolutions and industry upgrades.

There is now consensus among countries worldwide about the digital economy. More cities are looking for ways to transform and upgrade regional industries from the perspective of the digital economy. Huawei believes that Intelligent City construction should focus on improving governance, benefiting the people and promoting industry prosperity, so that Intelligent Cities can become the foundation of growing the digital economy. The digital economy will also become a main characteristic of industry development in Intelligent Cities.

#### • Five New Infrastructures for the Digital Economy

The infrastructures that are vital to development greatly vary from era to era. In the industrial era, we prioritized infrastructure components such as railways, expressways, and airports. In the consumer Internet era, the infrastructure that matters most is quite different. Take China, for example: In the past 30 years, it has undergone a rapid informatization process. It has built the world's largest optical fiber and wireless networks, with 37.47 million kilometers of optical cables deployed and 32,000 administrative villages connected to optic networks (with a coverage rate of more than 95 percent). A total of 6.19 million wireless base stations have been constructed and 1.88 million telecommunications towers have been erected in China (there are 2.3 million towers in the world).

The mass construction of this information infrastructure has enabled China to make outstanding achievements in the consumer Internet era, especially in the eCommerce industry. Online retail sales in China are twice those of the US, and the number of people who call a taxi or order a meal online



There is now clear international consensus about the digital economy's importance: Cities worldwide are looking for ways to use it to transform and upgrade regional industries. Huawei believes the foundation for developing the digital economy should be building Intelligent Cities aimed at improving governance, benefiting the public, and promoting prosperity for industries.

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



***In the future, as the focus of the digital economy shifts toward the Industrial Internet, and Intelligent Cities become the foundation of the digital economy, Huawei believes that the five new infrastructures of Intelligent Cities should be the cloud, IoT, data lake, AI, and video cloud. >>***

exceeds 200 million per day. Chinese people are getting used to a cashless society in which they make many of their purchases with their smartphones.

In the future, as the focus of the digital economy shifts toward the Industrial Internet, and Intelligent Cities become the foundation of the digital economy, Huawei believes that the five new infrastructures of Intelligent Cities should be the cloud, IoT, data lakes, Artificial Intelligence (AI), and video cloud.

IT systems have typically been constructed in a siloed or isolated mode. In the future, IT construction will be based on the cloud. The deployment and development of IoT, data lakes, AI, and video cloud will be based on the cloud, which will be the foundation of all infrastructures.

In future Intelligent City construction, the deployment of these infrastructures will be an indicator of whether or not a city is smart.

• **The Digital Economy Must Drive the Development of the Real Economy**

The digital economy consists of two parts. One is digital industrialization — this is the information industry. The information industry includes emerging sectors, such as electronic information manufacturing, telecommunications, and software services. The other is industry digitization, which refers to using digital technologies to increase output and efficiency. Industry digitization is an integrated part of the digital economy, including the increase in production quantity and productivity because of the application of digital technologies in traditional industries. The new output is an important part of the digital economy.

In the work report of the Two Sessions (NPC & CPPCC) in 2018, the Chinese government proposed to “develop new energy and momentum” and “fuel the construction of a digital China.” China’s positioning of the digital economy is not limited to emerging industries; the digital economy is considered a national strategy to drive the upgrade of traditional industries.

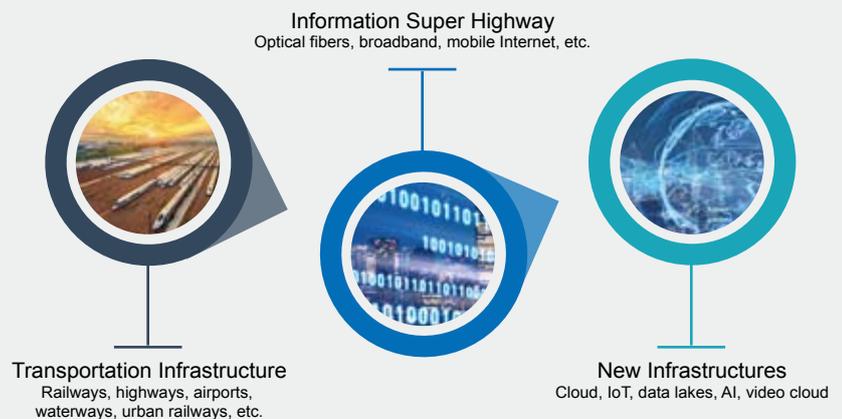
Most enterprises still focus on mining the value of management data through systems such as Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP). However, this data accounts for only 10 percent of the total amount of an enterprise’s data, and its value is very limited. Ninety percent of data comes from enterprises’ production systems. Real digitization requires the transformation of enterprise production systems (Operation Technology, OT), the digitization of the physical world, and the integration of production data with management data. This is the only way that data can generate greater business value.

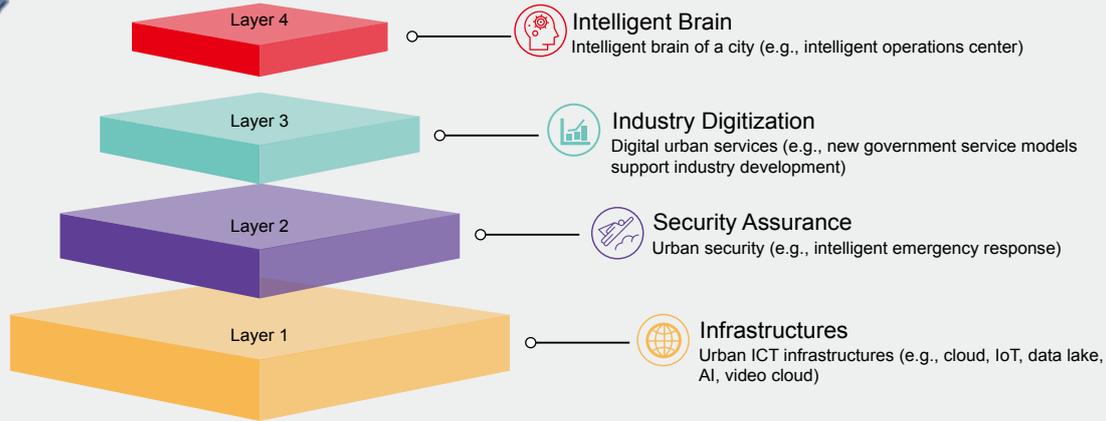
Enterprises have so far been unable to effectively perceive, collect, and analyze the 90 percent of data from the physical world. The real, fundamental challenge in developing the digital economy is working out how to digitize the physical world.

• **Industry Digital Transformation Relies on ‘Talent Dividends’**

Huawei founder Ren Zhengfei recently said that “a country’s prosperity starts in a primary school,” and he advocated “using the best talent to develop more outstanding talent.” Ren’s comments, which highlighted

**Building New Infrastructures**





the importance of basic education to China’s development, were widely praised online.

There is a sense that, in the digital economy era, China has not made enough progress in terms of digital technology education and talent cultivation. For example, according to the *Global AI Talent Report* published by LinkedIn, the scale of the AI workforce in the US exceeds 850,000; the number in India is 150,000; and there are 140,000 in the UK. In China, there are only about 50,000 AI employees.

To bridge that gap and boost China’s digital economic development, governments, enterprises, research institutes, and colleges should collaborate to bring to bear their respective strengths, develop scientific talent development policies, effectively implement policies, and create ‘talent dividends.’

**Implementing the Intelligent City Development Strategy**

Huawei has helped construct more than 200 Intelligent Cities in more than 40 countries around the world. Building on this experience, the company applies Maslow’s “hierarchy of needs” to its Intelligent City construction model, to ensure effective development. We divide the digital transformation needs of a city into four levels:

- At the base is the need for infrastructure, which is the basis for building a digital economy. There are five core infrastructures for Intelligent City deployment: the cloud, IoT, data lakes, video cloud, and AI. IoT includes both typical IoT technologies as well as nascent technologies such as 5G and Wi-Fi 6.
- The second layer is security assurance. Ensuring the security of the physical and digital worlds is the lifeline of urban development.
- Next, is implementing industry digitization to better grow the

real economy.

- Finally, there is the intelligent brain, which acts like the human brain in the sense that it guides the operations of Intelligent Cities.

This hierarchy helps execute the Intelligent City development strategy.

**Building Huawei Horizon Digital Platform for Intelligent Cities, Consolidating the Foundation of the Digital Economy**

To build great buildings, you need a solid and substantial foundation. And urban digital infrastructure is somewhat similar. We need to support the all-round, all-angle, and full-chain reconstruction of traditional urban industries and improve the productivity of all factors. Based on the extensive experience we have accumulated in digital transformation and cooperation with industry-leading enterprises, Huawei has developed Huawei Horizon Digital Platform as its foundation for digital infrastructure.

Huawei Horizon Digital Platform can coordinate various new ICT technologies and streamline different types of data. It supports rapid development and flexible deployment of upper-layer applications, and it streamlines bottom-layer connections, achieving synergy between the cloud, the pipe (or the network), and devices. In this way, cities can use the platform to lower the threshold for using new technologies and quickly integrate systems. Huawei Horizon Digital Platform has played an important role in the construction of Intelligent Cities around the world, paving the way for their digital transformation and smart construction.

**• A Perfect Combination: Huawei Technologies and Yiyang’s Approach**

In Yiyang, Hunan Province, China, Huawei closely collaborated

with the municipal government to outline the step-by-step Intelligent City development approach, with data as the source, industry as the core, public welfare as the goal, and the city as the foundation. The project was a perfect combination of Huawei technologies and Yiyang's approach. Yiyang has constructed infrastructure such as an eGovernment cloud data center, IoT, video cloud, GIS, and big data. Based on the open capabilities of these platforms and Yiyang's service requirements, Huawei collaborated with ecosystem partners to develop more than 10 services and applications for Yiyang, including smart agriculture, smart government, the Xueliang project (a public security project), Intelligent City management, smart water conservation, smart education, and smart healthcare. These applications and services improve the city's management and services, enhance its residents' sense of wellbeing, and boost industry development. In particular, the 'HUAWEI CLOUD + AI + IoT' solution benefited 200,000 farmers in 81 towns and 1,391 villages in Yiyang. The per capita disposable income in rural areas of Yiyang is more than 11 percent higher than Hunan province's average.

- **Lanzhou New District: Using Intelligence to Upgrade Industries**

In Lanzhou City, Gansu Province, China, Huawei and its partners have enabled the construction of a new smart district in the city by using Huawei Horizon Digital Platform. A new district was built using new concepts and methods. Intelligent technologies were used to upgrade all industries, and the largest data industry park in Northwestern China was set up. Smart healthcare was implemented, providing an improved experience for patients. Through the unified management and data sharing of the city's IoT, the level of network resource concentration was improved eight-fold, allowing Lanzhou to offer Internet + government services.

- **Longgang: 'Smart Brain' Is Responsible for the City's Holographic Management System**

In Longgang District, Shenzhen, China, Huawei helped build an 'Intelligent Brain,' which is an Intelligent Operations Center (IOC) that connects more than 30 service systems of government agencies, offices, and bureaus. The IOC presents city resources and information, such as weather, transportation, people flow, public safety, landscape, and drainage, as well as emergency response vehicle information, to city managers. Management departments can

use the IoT sensors to obtain real-time traffic information, emergency situation reports, and warnings on crowd density. The 'Smart Brain' has become a panoramic Intelligent City management system. It abstracts core value from various service data and intelligently presents it, helping city managers quickly understand the data and make decisions accordingly.

- **Gaoqing: Ensuring Safe and Controllable Systems for Hazardous Chemicals**

In the Smart Gaoqing project, carried out in Gaoqing County in Shandong Province, China, Huawei and the China Academy of Safety Science and Technology built a cloud-based full-process monitoring platform for the transportation and loading and unloading of hazardous chemicals, streamlining the service systems of the Administration of Work Safety, Quality and Technology Supervision Bureau, Traffic Management Bureau and the Public Security Bureau. Huawei Horizon Digital Platform horizontally integrates new ICT capabilities such as big data, video cloud, GIS map, and cloud computing, making the whole process of loading, unloading, and transporting hazardous chemicals transparent, safe and controllable in real time.

- **Yanbu, Saudi Arabia: Using Invisible Intelligence to Safeguard the City**

Yanbu is the biggest port city in Al Madinah Province, western Saudi Arabia. The annual flower show is its largest public activity. In 2018, invisible security guards — a group of smart lamp poles — were deployed in the city. In addition to lamps, the poles are also equipped with cameras, Wi-Fi, and LED screens, realizing the deployment of multiple services and systems, such as street lamps, monitoring devices, advertisement functions, and alarm systems, on a single pole, reducing the number of street poles by 80 percent. The HD 4K cameras installed on the smart lamp poles can run around the clock in all scenarios. The cameras continuously transmit data to the security command center in real time. Crowd density can be monitored in real time through crowd analysis, which helps predict traffic congestion in advance and implement proactive traffic distribution. This solution improves experiences for tourists and guarantees security in crowded areas.

Huawei manages the complexities, providing simplicity for our customers: We will help city administrators around the world by providing enabling technologies to drive local industry upgrades and economic growth. ▲

# Building the Smart City Industry Ecosystem — Attracting More Partners

By Yu Dong, Chief Engineer, Marketing and Solution Sales Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

**O**n April 20, 2019, both the Preparatory and first Joint Meetings of the Smart City Industry Ecosystem (SCIE) were held in Beijing. On May 7, the organization was officially launched at the *Smart Society Forum* of the *Second Digital China Summit*.

SCIE was jointly initiated by Huawei, China Xiong'an Group, the Shenzhen Institute of Standards and Technology (SIST), Beijing University of Aeronautics and Astronautics (Beihang), the China Electronics Standardization Institute, the



**Intelligent Cities are key to implementing the digital economy. The construction of the SCIE will bring the value of industry collaboration into play, transforming Intelligent Cities and the digital economy into powerful engines that will drive innovation and development in this new era, giving fresh momentum to China's informatization and urbanization.**

IC Card Application Service Center of the Ministry of Housing and Urban-Rural Development, and the China Institute of Electronics. Wu Hequan, an academic with the Chinese Academy of Engineering, acted as the chairman of the first SCIE Joint Meeting.

### **Intelligent City: An Important Driving Force of Development in the New Era**

In China, the idea of the Intelligent City has been prominent for more than a decade. Indeed, Intelligent Cities are growing rapidly as the country emerges as an important force for technological and industrial innovation in the global Intelligent City field. However, there are still weaknesses holding back the progress of China's Intelligent City development. For example, although governments at all levels believe Intelligent City construction is important — and have put much effort into it — ordinary urban dwellers have not experienced an improved sense of wellbeing in their day to day lives. This is because Intelligent Cities are complex systems that require a healthy industry ecosystem.

Intelligent Cities are not just the adoption of a particular technology or the implementation of a single project. This is something we have come to realize over 10 years of Intelligent City construction experience in China. Indeed, only through the digital economy, with the support of industry, and the development of professional services, can we work together to build and continuously develop an industry ecosystem for



The SCIE team at the organization's launch

Intelligent Cities.

### **Building a Digital Platform Through the Digital Transformation of Cities**

While the digital economy has become the driving force of China's economic growth, Intelligent Cities are the key to its implementation. Intelligent City construction begins with the building of an industry ecosystem. This ecosystem can then be used to address the many challenges of Intelligent City construction, including policy, overall requirements, and top-level design. In turn, the digital transformation of cities becomes the foundation for — and an inevitable path of — Intelligent City construction.

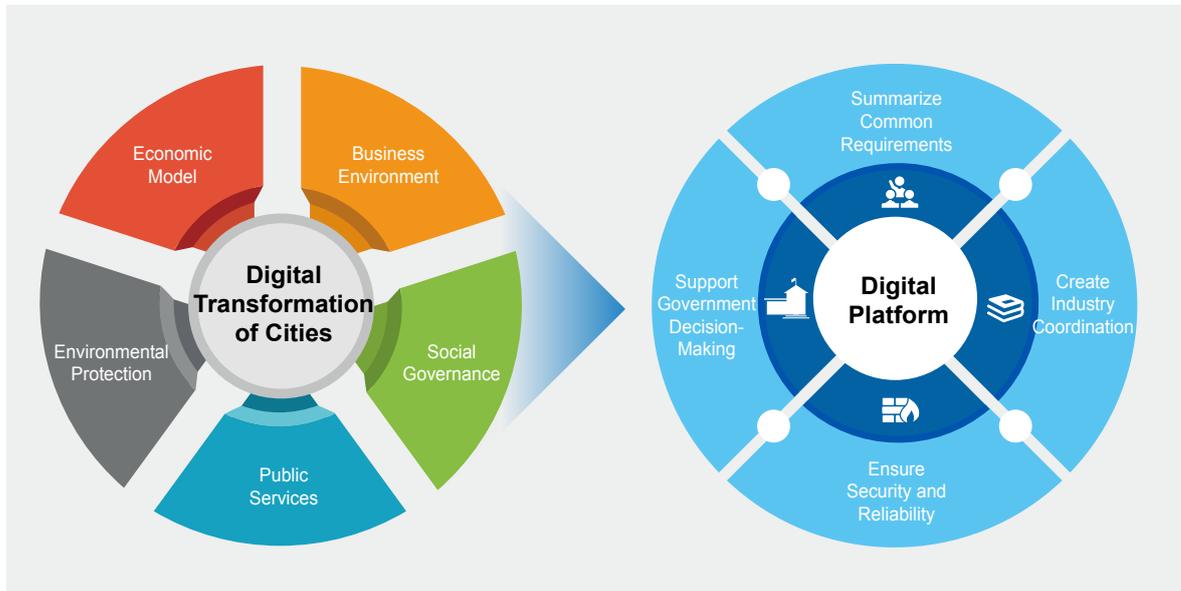


Figure 2. Building a digital platform and accumulating capabilities through the digital transformation of cities

Digital transformation of cities requires innovation of the economic model, an improved business environment, enhanced social governance, better public services, and boosted environmental protection capabilities. All of these problems need to be resolved by breaking out of the current model, which divides city construction from its management and Operations and Maintenance (O&M). The wisdom of industry think-tanks must be pooled to meet the requirements for Intelligent City construction, namely: systematic policies, full resource sharing, continuous ecosystem improvement, and the introduction of new technology.

Industry think-tanks need to support government decision-making and summarize common customer requirements. Digital platforms are essential to providing new ICT capabilities, making the development of smart applications simpler and facilitating innovation. In addition, a healthy ecosystem must be built to achieve industry collaboration and mutually beneficial cooperation.

Take Xiong'an New Area as an example. President Xi Jinping positioned Xiong'an as an innovative and green Intelligent City. Xiong'an will build a brand new digital platform enabled by industry policies and new technologies.

Xiong'an is integrating geographical information of the physical world with virtual space to form ubiquitous connections and generate massive amounts of data at the city level. This will eliminate boundaries between government departments and enable deep association of data.

A digital platform that integrates technologies, data, and services is crucial for all this to happen.

### Intelligent City Industry Ecosystem from Huawei's Perspective

As a leading global ICT solutions provider, Huawei needs to take into consideration its core value to society in order to better meet the needs of society and grow itself. This requires Huawei to identify the areas that can create real value for society and reshape people's lives, such as high-speed railways and eCommerce.

Huawei has been exploring the Intelligent City industry since 2012. Through years of practice, we know what Intelligent Cities need and we know what we have to offer. Experience has shown that the intelligence required by Intelligent Cities can never be accomplished by technology alone; Intelligent Cities must be driven by both technology



***SCIE aims to define the reference architecture oriented toward the industry market, build a digital platform, and optimize and integrate new ICT technologies, aggregating data to activate the digital assets of cities and reduce the difficulty of adopting new technologies. >>***

and services. So how can we integrate technologies with services? We must look at services from the perspective of technology, while identifying the technologies that can best promote service development.

To re-emphasize the point: Intelligent Cities can only be established with the support of both technology and services.

### **Building an Intelligent City Platform for Mutually Beneficial Cooperation**

SCIE aims to define the reference architecture oriented toward the industry market, build a digital platform, and optimize and integrate new ICT technologies, aggregating data to activate the digital assets of cities and reduce the difficulties in adopting new technologies. This way, we can develop innovative city applications with increased value, promote the digital transformation of cities, and boost the development of the Intelligent City industry.

SCIE will offer something of unique value to society and the industry, including:

- Realizing full industry chain participation and allowing all industry players to bring to bear their respective advantages to realize a model in which the sum is greater than the parts.
- Offering numerous ICT capabilities through a digital platform, implementing data and capability sharing, and providing complete service capabilities together with applications and terminals.
- Focusing on key scenarios in accordance with policies, defining leading architectures, increasing products and connections, and driving industry prosperity through automated tests.

Intelligent City construction involves policy guidance, analysis of requirements, top-level design, solution design, construction

implementation, and experience replication. To promote the development of the Intelligent City industry, SCIE needs to design its own functions to meet the requirements of the construction process.

Firstly, we must focus on customer requirements, including diverse requirements of Intelligent City operators, users, and policy makers. Secondly, Intelligent City construction involves the adoption of new technologies and the integration of new technologies with existing technologies. This requires capability openness and technical innovation. Therefore, a technology implementation center is needed. Two committees must be established for SCIE: the Strategy Steering Committee, and the Expert Committee. Furthermore, other end-to-end functional organizations must also be set up with SCIE, in response to industry policies, application scenarios, technical architecture, security technology, and more. Last but not least, SCIE must be able to continuously produce valuable content, including research reports, white papers, reference architectures, standard requirements, test platforms, and model applications.

SCIE will become a platform of mutually beneficial cooperation, attracting more players to contribute to the construction of Intelligent Cities, creating an innovation and development model driven by both technology and services, and bringing government administration, digital economic development, and smart society building to a new level. Meanwhile, Intelligent Cities and the digital economy will be the dual engines that drive innovation and development in China, boosting the country's informatization and urbanization. ▲

*Exclusive interview with Zheng Zhibin, President of the Global Smart City Business Department of Huawei's Enterprise Business Group*

# Building Roman-Style Intelligent Cities

By Zhang Shuai, Leiphone

The Fourth Global Artificial Intelligence & Robotics Summit (CCF-GAIR 2019) was held in Shenzhen from July 12 to 14, 2019. At the Smart City Forum held on July 14, Dr. Zheng Zhibin, President of the Global Smart City Business Department of Huawei Enterprise BG, delivered a keynote speech titled “The Digital Platform Leads the New Trend of Intelligent City Development” and proposed the ‘1 + 1 + N’ approach — representing one digital platform (Huawei Horizon Digital Platform), one smart brain (IOC), and N applications — for the design of Intelligent Cities.

## Why Intelligent Cities?

A foundation is needed for the development of the digital economy, and Intelligent Cities are taking up that mantle to become the engine of growth. Cities already contribute the most to GDP growth — making up 70 percent of global GDP, according to McKinsey, a consulting firm.

It is estimated that by the year 2050, there will be over 9 billion people living in cities worldwide. Meanwhile, an estimated 75 percent to 80 percent of China's population will be living in cities. Urbanization around the world is picking up pace, driving the development of the digital economy. It is vital to capitalize on this trend and enable the digital economy to create greater prosperity in the world economy.

Intelligent Cities will play a critical role in both urbanization and economic growth. A modern industry development system is one of the prerequisites to building an Intelligent City, which will undoubtedly boost the development of new technologies — such as Internet of Things (IoT), cloud computing, big data, and Artificial Intelligence (AI) — as well as promote the integration and application of information technologies.

The core value of Intelligent Cities is to further the development of the digital economy and improve living standards.

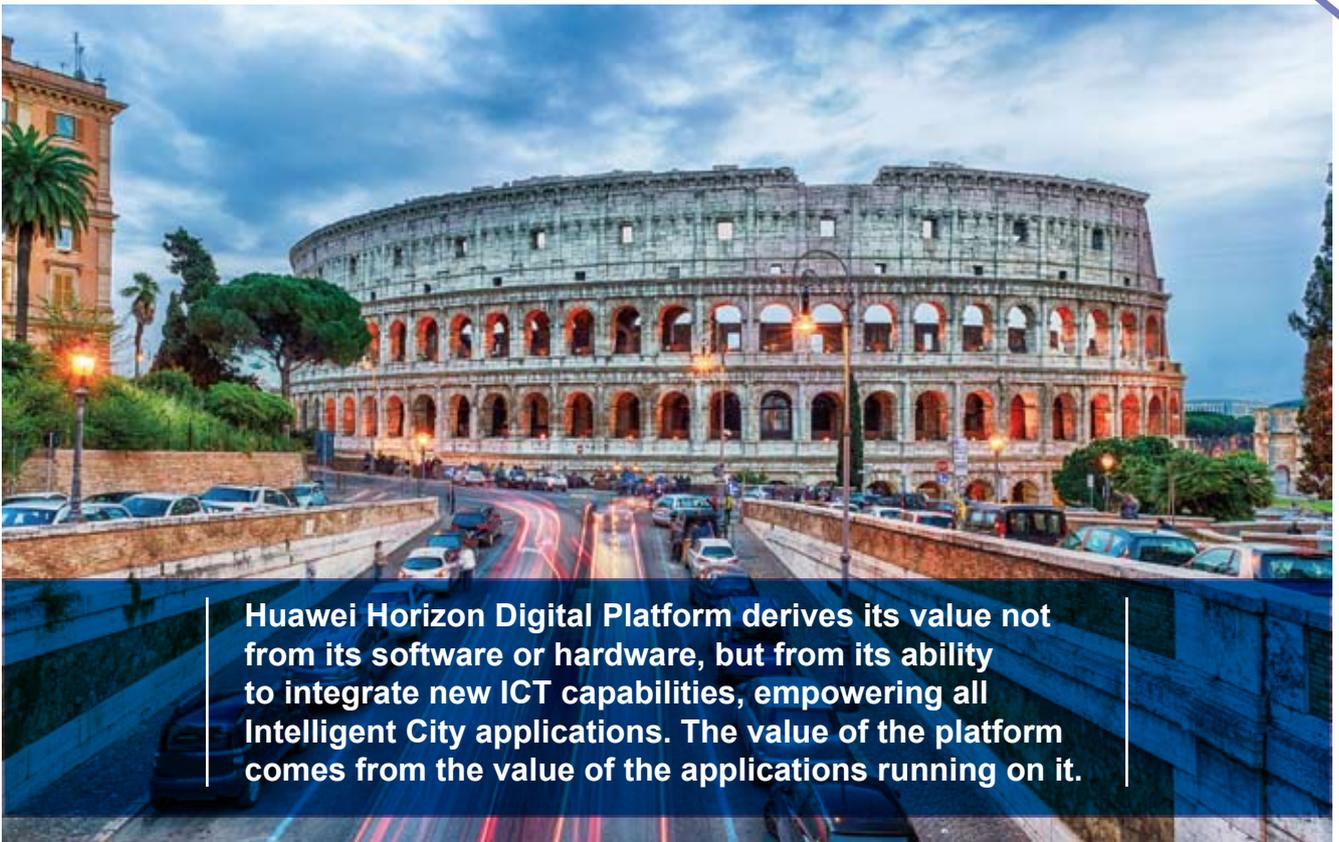
## Huawei's ‘1 + 1 + N’ Construction Plan with Huawei Horizon Digital Platform as its Foundation

Based on years of experience, Huawei has designed a new construction plan for Intelligent Cities called ‘1 + 1 + N.’ Huawei hopes to build one digital platform for Intelligent Cities with one smart brain for all applications that aggregates the data and capabilities of different industries. The ‘N’ refers to a wide range of smart applications that run on Huawei Horizon Digital Platform.

Huawei aims to build the Intelligent City's brain to integrate data and applications of various industries onto a single platform, unlocking the value of data and enabling better command and coordination in the city.

Huawei Horizon Digital Platform is the lynchpin that redefines the digital infrastructure for Intelligent Cities. Traditionally, digital infrastructure capabilities from different industries are built independently, which means they are isolated from each other and expensive to construct. Huawei aims to integrate all the basic capabilities and provide them as services to smart applications through Huawei Horizon Digital Platform.

In the past, enterprises needed to build a range of infrastructures — such as big data, video sharing, and convergent communication platforms — in order to launch a smart application. In the future, only one unified digital



**Huawei Horizon Digital Platform derives its value not from its software or hardware, but from its ability to integrate new ICT capabilities, empowering all Intelligent City applications. The value of the platform comes from the value of the applications running on it.**

infrastructure will be needed for the whole city. This is comparable to the city's physical infrastructure; when foundations like roads and pipes are built, buildings benefit.

The value of Huawei Horizon Digital Platform lies not in the functions or performance of its software and hardware, but in its ability to integrate new ICT capabilities that empower all Intelligent City applications. The value of the platform comes from the value of the applications running on it.

### **A Smart Brain that Can See and Think**

In addition to the digital platform, Huawei hopes a 'smart brain' that can 'see' and 'think' will help achieve the overall goals of Intelligent Cities.

The smart brain is firstly a display center and serves as a museum for the city's evolution. Secondly, it will monitor the operating status of the entire city to support decision-making in emergencies and enable departments at all levels to implement unified command and dispatch. Furthermore, the smart brain can provide many of innovative and entrepreneurial services.

In short, the smart brain is responsible for the following roles:

- **The eye of the city:** Shows the overall situation of the whole city — including economic development, environmental pollution, traffic,

and public services — through clearly structured and classified data.

- **The decision-making center of the city:** After obtaining a comprehensive view of the city through data, city administrators can make fact-based decisions. Every year in Shenzhen, the municipal government invests heavily to support local enterprises without evaluating the results. Do these enterprises require more funds or supportive policies? After integrating data from various industries, the smart brain can show the detailed effects of government initiatives — from companies that performed better with government funding, to companies that could not profit even with government funding, and those that require policy support instead.

- **The brain of the city:** The brain is central to the human body — it coordinates every part of the body, working in unison to effectively perform tasks. Similarly, the smart brain of a city effectively integrates resources of various industries and processes multi-dimensional data to tackle problems comprehensively.

- **The data display screen:** From the mayor of a city to the director of each government agency to grassroots law enforcement personnel — they all need a 'screen' to perform their duties and establish links. The smart brain presents data on large and medium-sized screens, and even on smartphones. The data displayed can assist

city managers with management decisions, issuing orders, and scheduling resources.

- **The innovation and entrepreneurial platform:** How can the smart brain platform create an environment that is conducive to development and innovation in the city, and empower innovation for Small and Medium-Sized Enterprises (SMEs) and startups? In an effort to push these boundaries, the Shenzhen Municipal Government is working with Huawei to explore methods for attracting more SMEs to contribute to the Intelligent City ecosystem by sharing resources.

- **The industry incubation center:** Today, traditional industries face a myriad of challenges, hindering their growth potential. However, the new economy — with the digital economy as its core — is booming, with governments around the world prioritizing its development. Intelligent Cities act like industry incubation centers. By building more Intelligent Cities, an extensive and strong industry ecosystem will also flourish.

### **Building Roman-Style Intelligent Cities**

As the saying goes, all roads lead to Rome. The ancient city is the epitome of its citizens' wisdom and ingenuity in urban construction. When roads were first built, a range of supporting infrastructure features, including water pipes and sewers, were built alongside them, paving the way for the construction of public venues such as theaters and public bathrooms. Furthermore, these infrastructures and services were crucial to the survival and development of the city by ensuring a clean, healthy, and secure environment, preventing the spread



***Intelligent Cities are built step by step. Huawei has always believed that the informatization process should focus on services. The core of Intelligent Cities is the city itself, and digital technologies must facilitate their development. Digital technologies have been applied to all aspects of city development, but Intelligent City construction is not merely the process of informatization.***

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of plagues.

The philosophy of Huawei Horizon Digital Platform is similar to the approach used in the building of Rome. Both prioritized the building of 'roads' and the deployment of auxiliary facilities. Currently, no other vendors are taking the same approach. Looking at Intelligent City development from a holistic point of view, a unified digital platform must be established. This is akin to main roads, along which other public facilities such as water pipes, cables, and gas pipes should be deployed. Government initiatives — with higher standards and requirements — would require major services to be built, while community services would be less demanding. Many cities are now ready for the construction of a unified digital city. When new government services and capabilities are mature, the digital platform can be expanded — with branch platforms created — to provide many other auxiliary services.

Therefore, for future-oriented digital platforms, deciding how these small branch platforms should coordinate and interconnect with the main platform needs to be a priority. Huawei has built a unified platform that enables various platforms and applications to be integrated into one, with support for platforms from other vendors.

### **Building the Intelligent City Step by Step**

Intelligent Cities are built step by step. Huawei has always believed that the informatization process should focus on services. The core of Intelligent Cities is the city itself, and digital technologies must facilitate their development. Digital

technologies have been applied to all aspects of city development, but Intelligent City construction is not merely the process of informatization.

Governments are most concerned about implementing good governance, raising living standards, and driving industry prosperity — ambitious goals that digital technologies can help governments achieve. For example, many government apps simplify various public services, so residents now need to go to a physical service center only once. This is because background data has already been aggregated, and the processes streamlined and reconstructed, improving efficiency and enhancing residents' lives.

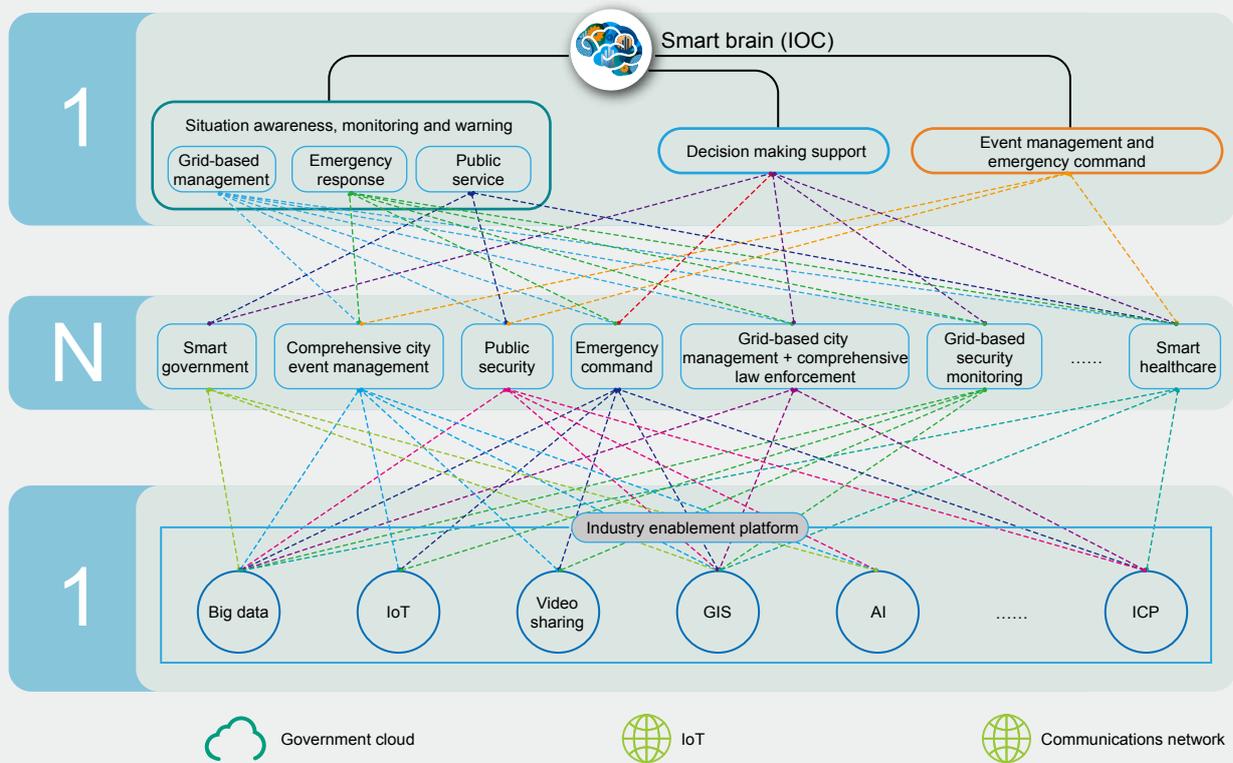
Without information technologies, it would be impossible to integrate data and streamline processes. Yet, in conjunction with the new technologies, traditional management methods still play a role. In the

digital era, information technology has become a general technology that enables a multitude of government services and city applications.

The emergence of Intelligent Cities has become a powerful trend for both developed and underdeveloped cities. Huawei HiCity solutions have been successfully deployed in developed Tier-1 cities as well as Tier-2 and Tier-3 cities in China. Huawei strives to align its solutions with the vision of mayors around the world. Only when the head of a city recognizes the significance of Intelligent Cities and is willing to use digital technologies, can the city truly become smart.

Based on Huawei's experience, a successful Intelligent City project requires a dedicated government that is willing to invest, can swiftly execute, and is ready to cooperate with companies. Intelligent City development must be pioneered and led by the government, with companies acting as the enablers and implementers. ▲

### Intelligent City Construction Approach: 1 + 1 + N = Huawei Horizon Digital Platform + Smart Brain (IOC) + N Applications



# Top-Level Design: Drawing a Blueprint for Intelligent Cities

By Yuan Wanhai, Nie Junyu, and Yang Lizhi, Smart City Experts, Enterprise Business Group, Huawei China

Intelligent Cities are the main focus of digital transformation in urban areas. It is a new concept and model that promotes Intelligent City planning, construction, management, and services by using new Information and Communications Technology (ICT) such as Internet of Things (IoT), cloud computing, big data, mobile internet, and spatial and geographic information. This is an innovative application of next-generation information technology in city transformation, and represents the end-goal for future development trends of cities. China has proposed to leverage Intelligent City construction and drive the transformation of its urban development, as evidenced by its 13<sup>th</sup> Five-Year Plan (which covers 2016 to 2020), the informatization development strategy, and the *Central City Work Conference*. With a more comprehensive understanding of Intelligent Cities, an increasing number of cities nationwide are prioritizing ‘Intelligent City’ as their current and future development strategy.

The Intelligent City top-level design serves as a blueprint between planning and implementation — featuring overall clarity and operability — that can be easily followed, preventing disordered construction. It is applicable to the informatization construction of cities, departments, districts (counties), campuses, as well as rural areas. The top-level design adopts the openness principle and is based on the most widely used and recognized enterprise architecture in the global market — The Open Group Architecture Framework (TOGAF). In accordance with fair and accurate evaluations of customer requirements alongside the status quo, the design covers Intelligent City service, data, application, and infrastructure architectures, as well as including the implementation path and assurance system of architecture implementation.

## The General Approach

The Intelligent City top-level design is a comprehensive analysis

method used to analyze and design the implementation path of an Intelligent City. It is divided into three stages: diagnosis reports, core architecture, and implementation schemes.

### • Diagnosis Report

Comprehensively analyzes factors such as city development requirements, informatization status, informatization policy requirements, external resources, and benchmark cities, then determines the boundaries and foundation of Intelligent City construction. The main focus is to comprehensively analyze the informatization requirements of a city and upper-level policies, as well as the informatization status and objectives, then determine the key objectives of Intelligent City construction and the ideal framework design. Moreover, this solution also comprehensively analyzes resources provided by benchmark cities and both upper-level and lower-level organizations, and identifies existing and available resources for Intelligent City construction, preventing avoidable reconstruction and resource waste.

**The Intelligent City top-level design serves as a blueprint between planning and implementation. Drawing from the experience accumulated from top-level designs of over 100 Intelligent Cities in China, Huawei has formulated a method for implementing the Intelligent City top-level design, which is divided into three stages and eight steps.**

- **Core Architecture**

Designs the service, data, application, and infrastructure architectures of Intelligent City construction, while specifying the internal structure of resources, systems, platforms, and infrastructure involved in Intelligent City construction, and the relationships between the structures. As a business and practical work oriented solution — consisting of business types, business items, and the service process of business architecture — data architecture and application architecture are determined based on work requirements obtained from analyzing the relationship between services and resources as well as between services and systems. Data architecture includes the resource content, shared relationship, and database, while application architecture includes the system, module, and system function. Finally, general functions are extracted from the application architecture and the infrastructure architecture is determined in line with the principle of advanced deployment configuration.

- **Implementation Scheme**

The ideal architecture can be transformed into a future operable project by clarifying key projects, management mechanisms, operation modes, and informatization standards, ensuring the smooth implementation and subsequent maintenance of various Intelligent City architectures. The Intelligent City construction project, project management mechanism, operation mode, informatization standards, and human, financial, and material resources are determined by comparing the architecture with the current situation according to the requirements of the core architecture and existing resources.

### **The Three Stages and Eight Steps**

The Intelligent City top-level design can be divided into three stages

and eight steps.

- **The Early Analysis Stage**

- **Step 1: Analyze the internal and external environment.** Analyze the internal and external factors that may affect Intelligent City construction, including policy environment and technical environment analyses, as well as city positioning and problem analyses. Policy environment analysis refers to analyzing the requirements of national Intelligent City policy documents, as well as analyzing the informatization policy environment in terms of development opportunities and informatization development requirements. Technical environment analysis refers to analyzing the development trend and application basis of new ICT technologies — such as IoT, cloud computing, big data, and Artificial Intelligence (AI) — and identifying opportunities new technologies can create for Intelligent Cities. City positioning and problem analyses both summarize a city's characteristics and development objectives, examine the challenges facing city development, and determine the inherent demands and requirements of city development for informatization.

- **Step 2: Informatization survey.** The service status, informatization status, and informatization requirements are studied by surveying city managers, general workers, informatization personnel, and the public, through document analyses, questionnaires, and onsite surveys. The business survey is conducted to understand and analyze business entities, business informatization support, service usage, resource generation, and service collaboration. The informatization status survey analyzes the informatization development status with respect to network infrastructure, common support platforms, core information systems, database construction,



*The Intelligent City top-level design is a comprehensive analysis method used to analyze and design the implementation path of an Intelligent City. It is divided into three stages: diagnosis reports, core architecture, and implementation schemes. The Intelligent City top-level design can be divided into three stages and eight steps. >>*

information resource development and sharing, and the informatization development environment. It also diagnoses any weaknesses and existing problems in the current infrastructure. The informatization requirement survey analyzes the basic informatization requirements of each type of service object.

- **Architecture Design Stage**

- **Step 3: Service architecture design.** Clarify business functions — including key businesses and business categories — and describe the service architecture from a general to detailed level with respect to service type, service items, and service process. This service architecture meets the requirements of decision makers; emergency commands; the public; and government service management, and specifies the coordination relationship between services. Then draw the service architecture diagram, including the service category and service items.

- **Step 4: Data architecture design.** Analyze the resource input and output that supports each business item and arrange them according to the business line, to form the overall resource requirements and sharing information. Draw the resource architecture diagram — including the internal service database, theme database, and relationship between the databases — and then determine the data content, source, existing foundation, and construction mode of the database.

- **Step 5: Application architecture design.** Analyze the informatization system and informatization requirements that support each business item, arrange them according to the business line, and combine similar requirements to form the overall informatization requirements. Then draw the system architecture diagram — including the new systems, upgraded and reconstructed systems, existing systems, and the relationship

between systems — and describe the system objectives, main functions, existing infrastructure, and construction mode.

- **Step 6: Infrastructure architecture design.**

Determine the requirements for sharing public intelligent application support platforms, and describe the application support platforms to be built, the construction objectives, service content, managers, builders, service modes, and the service scope. Then determine the requirements for sharing infrastructure, such as networks, equipment rooms, and information security; describe the infrastructure to be built, including data centers, networks, and terminal devices; and outline the construction objectives, managers, and builders.

- **Implementation Scheme Design Stage**

- **Step 7: Formulate the implementation plan.**

Analyze the gap between the current architecture and the target architecture, and provide suggestions on system upgrades, discarding, or integration. Then, design key projects, including construction objectives, construction content, business issues to be resolved, as well as budgets and plans. Finally, prioritize the project construction on the basis of importance and urgency, divide up the construction phase based on the project construction priority, and allocate related resources.

- **Step 8: Develop the solution.** Analyze the investment, construction, and operation modes of key projects, determine the boundaries of cooperation between the government and enterprises, and design innovative and feasible system investment, construction, and operation modes. Subsequently design the supporting policy and standard system, including the standard requirements for services, data, application systems, and basic networks. Finally, propose resource assurance measures in terms of talent and capital to ensure a smooth Intelligent City construction.



*Huawei provides consulting services related to the top-level design for over 100 provinces, cities, districts, and counties across China. In doing so, Huawei has accumulated substantial experience in Intelligent City top-level design of varying scales, types, and requirements. >>*

### Case Studies of the 100+ Intelligent Cities

Huawei provides consulting services related to the top-level design for over 100 provinces, cities, districts, and counties across China, including Jilin, Guizhou, Shanghai, Chongqing, Shenzhen, Wuhan, Kunming, Xiamen, and Hohhot. In doing so, Huawei has accumulated substantial experience in Intelligent City top-level design of varying scales, types, and requirements.

- **Digital Jilin: One of the First Provinces in China to Carry Out Integrated Planning of the Digital Economy and Digital Government**

Huawei has developed the ‘121’ digital Jilin framework for the province through system surveys and analyses, combined with the requirements specific to Jilin:

- **‘1’:** Using the digital government construction as a foundation, government function transformation was accelerated, public service levels optimized, and social governance capabilities improved with the use of digital platforms and means.

- **‘2’:** The intelligent upgrade of the automobile industry, agricultural digitalization, smart logistics, digital culture and tourism industry, as well as the integration of digital technology with the medical and health industry was determined by treating industry digitization and digital industrialization as the key development direction, combined with the industry foundation and characteristics of Jilin Province. In accordance with the development idea of ‘going out’ and ‘taking in,’ it is now necessary to further expand the original advantageous industries such as satellite and aerospace information, electronic information, and electronic commerce, allowing industry enterprises to go beyond Jilin — expanding on a national or even global scale. Meanwhile, it is also necessary to focus

on developing new industries such as cloud computing, big data, and the IoT.

- **‘1’:** Intelligent City construction is the main way to address social issues, such as public security, disaster prevention and mitigation, environmental protection, and safe production.

- **Huangpu, Shanghai: One of the First to Implement the Top-Level Design of the System Planning Business Platform in China**

Huawei has established the overall framework of Smart Whampoa for Huangpu in Shanghai — including two networks, one cloud, one center, five platforms, and N key projects — through systematic research, analysis, and benchmarking with leading practices in and outside China:

- **The Infrastructure Layer:** The optical and wireless networks of the city were optimized; construction of the eGovernment cloud center was developed; ‘cloud-network synergy and cloud data linkage’ were implemented; and the load capacity of the information infrastructure was constantly improved.

- **The Resource Layer:** A regional big data center was built by collecting government inventory data, IoT-generated data, and social open data, then implementing data exchange, sharing, analysis, and use.

- **The Platform Layer:** Strengthened system integration and data collection, and built five management platforms: government service collaboration, urban operations, public security, macroeconomic data sharing, and market supervision.

- **The Application Layer:** Grasped the two key points of high-quality development and high-quality living, while constructing 11 key projects including Smart Bund, Smart Community, and Smart Elderly Care, bringing smart applications to new heights.



**Huawei has developed the '121' digital Jilin framework for the province through system surveys and analyses, established the overall framework of Smart Whampoa for Shanghai Huangpu, and determined the overall framework of '1 + 4 + N' for Tianjin Binhai District, using AI technology to build a world-leading Intelligent City. >>**

**• Tianjin TEDA: One of the First to Propose Top-Level Designs of AI+ Intelligent Cities in China**

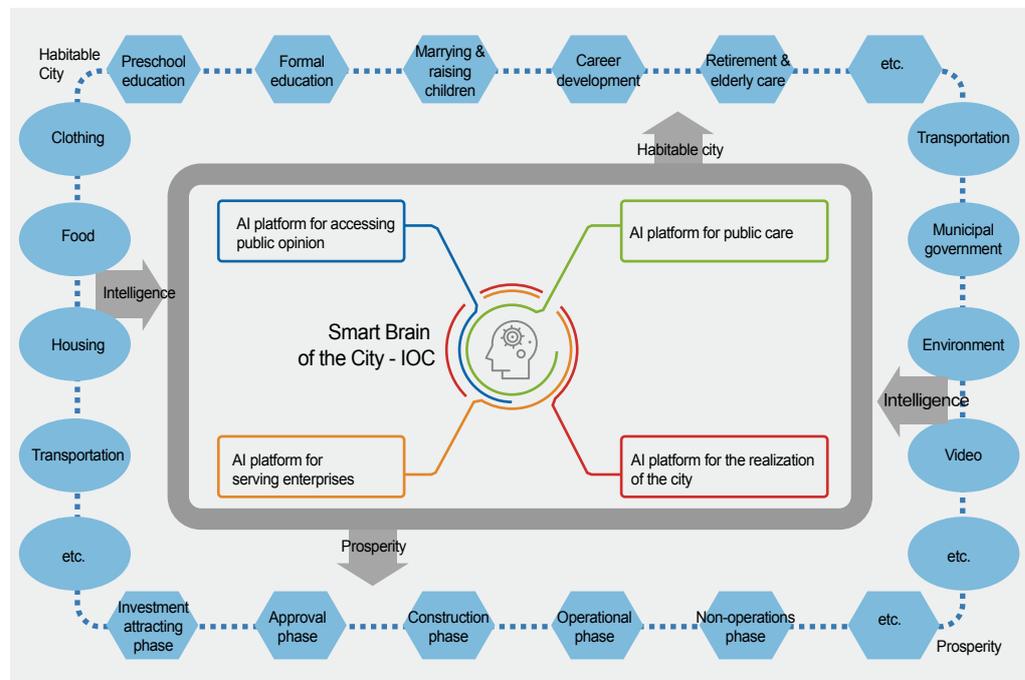
After systematic research and analysis, Huawei determined the overall framework of '1 + 4 + N' for Tianjin Binhai District, using AI technology and the 'Happy TEDA (Tianjin Economic-Technological Development Area) indicator system' in order to build a world-leading Intelligent City:

- **'1'**: The Intelligent Operations Center (IOC) collected data from governments, enterprises, citizens, the Internet, and IoT to implement an in-depth value analysis from the following three aspects: the prompt detection of city fluctuation and supply of real-time monitoring dashboards for managers; the supply of comprehensive decision-making assistance and service process optimization services for decision-makers; and the implementation of scientific prediction, prior

warning, and emergency linkage management for major emergencies in cities.

- **'4'**: The four AI enablement platforms include the AI platform for accessing public opinion, allowing managers to fully understand peoples' perspectives and needs; the AI platform for the realization of the city, establishing a harmonious social order by comprehensively exploring the internal relationships among people, places, events, and things; the AI platform for public care, allowing the public to enjoy personalized services throughout their lives with accurately matched service resources; and the AI platform for serving enterprises, accurately pushing services to enterprises by determining the internal relationships of the industry.

- **'N'**: The AI+ innovative applications of Happy TEDA focus on building a safe, beautiful, convenient, harmonious, civilized, and dynamic AI+ innovative application group. ▲



Four AI enablement platforms in Tianjin TEDA



# Intelligent Operations Center: A Smart Brain for City Management

By Pei Yong, Smart City Solution Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

## Objectives and Positioning of the IOC

In the construction of an Intelligent City, an Intelligent Operations Center (IOC) is crucial. As the smart brain of a city, the IOC needs to fulfill the responsibilities of the four centers of the city: the decision-making, warning, governance, and command centers.

- **Decision-making center:** Big data is used for data analytics and mining in order to present the key points and difficulties in city management, supporting government decision-making.

- **Warning center:** Predicts potential risks, and provides warnings in advance to prevent major emergencies.

- **Governance center:** Collects, processes, and monitors city operations in a unified manner to improve collaboration efficiency, implement quick response, optimize city management resources, and improve city governance.

- **Command center:** When a major event or emergency occurs in the city, the command center coordinates multiple departments to implement unified command, action, and resource allocation, achieving cross-level, cross-region, and cross-department command and dispatch. The command center must support video dispatching, multi-party communication, video consultation, and mobile office operations, to ensure that the command center is available wherever the government officials are. This enables the officials to make informed decisions remotely if there is an emergency.

## Huawei's IOC Application Scenarios

The functions of Huawei's IOC can be summarized as '1 + 4.' '1' refers to the display of the overall situation of a city, and '4' refers to the four platforms of decision-making support, monitoring and warning, event management, and collaborative command. The overall situation is displayed like a dashboard for city administrators, presenting them with the running status of the city as well as potential risks.

The decision-making support platform is used to analyze data in detail and assist decision-making, issuing work instructions through forecast analysis, drilling analysis, and comparison analysis. When the root cause of a problem is identified, it needs to be solved and cross-department work arrangements need to be made. The work instructions generated are sent to the incident management platform, which processes it as a normal task, assigning it to responsible departments. Department managers only need to track the incident-handling process.

The monitoring and warning platform can proactively detect potential risks and problems, and generate alarms as the information input for incident management or emergency command. Common alarms are handled by the incident management platform in a cross-department manner. When the nature of an incident changes or major risks are detected, the incident is escalated to the joint command

**In the construction of Intelligent Cities, an IOC is crucial. As the smart brain of a city, the IOC is made up of four centers: the decision-making, warning, governance, and command centers — with each serving an important role.**

platform for handling.

The monitoring and warning platform sends detected alarms to the IOC dashboard for display, so that city administrators and operations personnel can obtain the alarm information in real time. In addition, the platform sends the alarm information to the emergency command service module for emergency response. The alarm is then handled through collaborative command and dispatch.

The functions and platforms, such as overall situation display and decision-making support, complement each other and effectively implement closed-loop city management and operations.

- **Overall Situation Display**

The overall situation display platform displays data from key operational indicators of a city, and implements panoramic analysis of economic innovation, people's livelihoods and happiness, government services, the human environment, comprehensive governance, and the public security of a city. The overall situation analysis is characterized by fixed analysis indicators. The key indicators concerning city administrators are selected and customized based on the city's needs, and may include many global-level indicators. In addition, indicators can be adjusted based on service development and more suitable indicators can be selected for display. Indicators are displayed graphically, and are intuitive, vivid, and easy to understand.

The overall situation analysis of the IOC provides a panoramic view of the city for city administrators and decision-makers. It automatically generates and visualizes key indicators of city operations. This changes the current situation, characterized by information separation and data fragmentation, and instead enables city managers to have a comprehensive view of their city. They can gain insight into the city's running status at macro-, medium-, and

micro-levels using these key indicators.

For example, in Longgang District, Shenzhen, the local government leaders can use Huawei's IOC system to view the overall running status of the whole district on one screen. Seven graphs are displayed on the large screen in the IOC hall, displaying the overall situation, economic development, public security, events, government services, living environment, and people's livelihood throughout the district. The seven graphs contain more than 1,600 indicators in seven categories, reflecting the running status of all aspects in Longgang in real time. In addition, government leaders can access the IOC through mobile terminals and LED screens anytime and anywhere.

- **Decision-Making Support**

The decision-making support platform performs comparison, association, trend, prediction, and drilling analyses on data to implement in-depth topic analysis, identify the root cause of a problem, and provide decision-making support. Compared with overall situation display, topic analysis places higher requirements on the depth and width of basic data. Therefore, special data analysis models are required. The decision-making support platform can use different data sources and analysis models to address different problems. Therefore, the IOC can carry data from multiple industry application fields and develop analysis models of multiple fields to implement decision analysis.

The decision-making support platform provides a series of tips for city managers and decision-makers, helping them solve problems in city management. Cities around the world face the same problems in development — such as rapid population growth, traffic congestion, and environmental pollution — and all can learn from each other.

Based on the city's big data, the decision-making support

platform provides topic analysis applications in various fields. These applications are usually developed by Huawei’s ecosystem partners (usually big data companies or scientific research institutes from specific fields) and have been successfully implemented in many cities. By using the decision-making support platform, ecosystem partners can deploy their best practices and professional analysis models on the platform, and then adopt the same applications in other cities. They can also continuously upgrade and optimize their models, and accumulate experience and knowledge to improve the prediction capability and accuracy of analysis models. This greatly reduces the experimentation costs and shortens the development period. The IOC decision-making support platform has attracted hundreds of analysis models, in more than 10 domains from 300 ecosystem partners. The platform will continue to accumulate more models to provide rich content and input for the availability and practicability of the IOC.

The decision-making support platform of the IOC has activated government big data that has been inactive for many years, optimizing its huge value. By integrating the data of different government departments as well as data from the Internet, in-depth data analysis and mining can be performed. Data has now become a new industry, and a driving force of urban development in terms of city management, environmental protection, and public service.

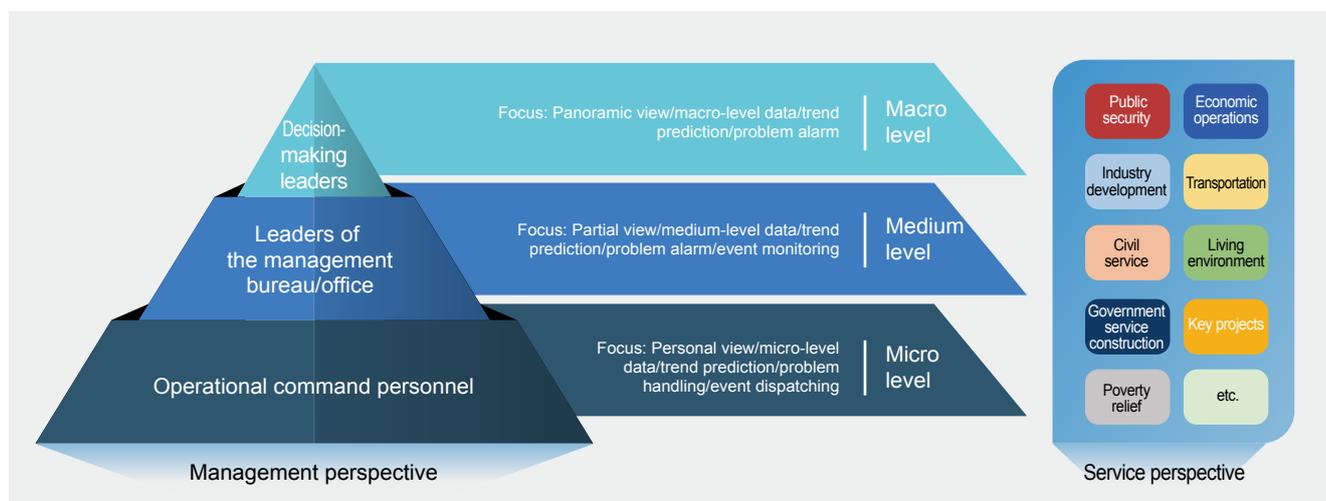
For example, the Tianjin TEDA Group used the IOC decision-

making support platform to develop the one-person-one-file application, which outlines public opinions and requirements, work directions, and difficulties for the government as it provides public services. The app also provides abundant data for optimal urban management and social governance. Another example involves Longgang in Shenzhen. The Longgang government used the IOC decision-making support platform to monitor industrial and economic operations, industrial land use, and enterprise migration. The platform offers a barometer for analyzing the economic operations of Longgang and provides strong support for the government to formulate effective policies.

• **Monitoring and Warning**

The IOC can collect and filter alarms generated by different application systems of the city, generate a list of alarms that need to be processed, and respond to (and handle) alarms using emergency response or event management, analysis, and assessment.

The IOC implements association analysis for alarm information from different departments and systems, including alarms from geological disasters, social events, bad weather, major epidemics, traffic accidents, flammable and explosive sources, production safety risks, and fire risks, assessing the risks behind alarm information based on the warning mode to determine the risk level of the alarm. Then, the system can carry out emergency plans to cope with the risks. Furthermore, the IOC can be directly connected



A glance at the IOC



with Internet of Things (IoT) system to obtain the status information of facilities and devices in real time. Based on the warning model, the IOC then analyzes potential risks, generates warnings, displays the information on the IOC dashboard, and notifies corresponding departments or personnel in real time. In addition, the monitoring and warning platform of the IOC can help respond to emergencies through geographical locating tools, onsite video transmission, display of different levels of alarms in different colors, and notifying relevant personnel through multiple channels (including emails, calls, SMS, and WeChat messages).

For example, in the Tianjin Eco-City IOC project, the video-sharing platform and Artificial Intelligence (AI) platform were used to analyze the traffic flow of roads in the city, realizing early traffic warning then implementing automatic control of traffic lights, effectively alleviating traffic congestion during rush hours. Another example is Longgang's IOC project in Shenzhen, which uses the video sharing platform and AI platform during its second phase to analyze HD surveillance videos, and implement seven types of pre-alarms, including pre-alarms for people gathering, pre-alarms for illegal road occupation, and pre-alarms for illegal vehicles. This solved the challenges faced by the district, including limited management resources, and large-scale monitoring.

- **Event Management**

The city's IOC system is usually responsible for cross-department event handling. Events that can be independently handled by a single department do not need to be handled by the IOC. As such, the IOC handles events that require coordination across departments. In the entire event management process, responsible departments need to know their corresponding nodes and the work to be done at the nodes. In addition, a work prompt message is sent

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*Huawei's IOC decision-making support platform has attracted hundreds of analysis models, in more than 10 domains from 300 ecosystem partners. The platform will continue to accumulate more models to provide rich content and input for the availability and practicability of the IOC. >>*

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to corresponding node owners, so that they can start processing tasks. By monitoring and evaluating the event management process, city administrators can learn about the performance results and position of each department (assessed by the IOC) in a timely manner.

The event management platform cannot replace the existing service application systems of each department in a city. Instead, it cooperates with the existing systems to implement cross-organization, streamlined work processes. Additionally, the event management platform is also responsible for events that are not clearly defined and need to be assigned to different departments, or events that have a major impact and need to be decided by top government officials. For example, requests received from citizens by the hotline, requests from citizens or enterprises that cannot be clearly attributed to a specific department, or events that cannot be handled by government departments, offices, or bureaus, and need to be escalated to higher-level departments for decision-making.

The event management platform of the IOC promotes the upgrade of city management from a modular, grid model to an intelligent model. New technologies and tools are used to greatly improve working and communication efficiency, driving the reform of government operations and organizational structure, and allowing governments to establish a management system that features quick response, controllable processes, and integration of supervision and guidance.

Huawei is piloting and exploring the event management platform in the phase-2 IOC project in Longgang, Shenzhen; the IOC project in Zhangjiagang, Jiangsu; and the IOC project in Huangpu, Shanghai.

- **Collaborative Command**

The event management platform of the IOC handles daily incidents, while the collaborative command



*Huawei's IOC collaborative command platform combines key event command with the city's big data, enabling big data-based, scientific command. The platform also supports the sharing of platform resources when managing both major events and daily incidents. >>*

platform handles critical and emergency events. The handling of major events depends on the preset contingency plans for coordinating personnel, organizations, resources, and facilities in a unified manner, in order to achieve cross-department, cross-region, and cross-industry collaboration, while eliminating security risks during major public events.

While major incidents are identified and reported by IOC personnel or members of the public, major potential risks are automatically detected and reported by the IOC monitoring and warning platform. When handling incidents, the IOC collaborative command platform can implement 'one-screen display, one-click command, and one order for all.'

- **One-screen display:** The collaborative command platform visualizes resources, and facilitates quick search, location, and unified scheduling. The video and image of the accident scene can be sent back to the IOC display in real time. The execution process and progress of the emergency plan can be visually displayed on the IOC's screen. Experts and stakeholders can hold remote video conferences using the IOC screen. The IOC's large screens, medium-sized screens (such as desktop computers, conference room screens, or outdoor LED screens), and small screens (such as smartphones or tablets) support multi-screen synchronization.

- **One-click command:** The collaborative command platform enables one-click initiation and automatic emergency plan command. Resources — personnel, vehicles, and materials — are prepared based on preset plans, while fire, first aid, environmental protection, and transportation departments collaborate to complete tasks accordingly. In this way, efficient cross-organizational collaboration is implemented and

the response speed is improved. In addition, one-click command can initiate multi-party video conferences and message communications, allowing personnel from different departments, regions, levels, and roles to participate in the command and dispatch process during major events. The one-click command function enables users to connect to multiple communication devices, such as mobile terminals, fixed-line phones, and video conferences, with one click, making communication simple and fast.

- **One order for all:** The collaborative command platform emphasizes that a comprehensive emergency plan must be prepared to respond to major events. The decision-makers of a city must be able to take over the highest command power of the IOC in emergencies. Directives issued by the IOC must be executed by all departments and personnel. Each department needs to respond quickly to reduce damage and avoid the loss of life caused by incidents. The IOC needs to provide a mobile command center for city managers and decision-makers to ensure that city leaders can access the IOC anytime, anywhere.

The IOC collaborative command platform combines key event command with the city's big data, enabling big data-based, scientific command. The platform also supports the sharing of platform resources when managing both major events and daily incidents.

For example, the IOC project in Pingwang, Suzhou, provides a 'one-screen display.' The town's mayor uses the IOC to monitor videos in real time and view basic information about infrastructure, sanitation, and personnel in key areas, as well as the town's environmental status. City managers use this information to issue command to the necessary departments in real time, implementing unified video dispatching and command. ▲



# Driving the Sustainable Development of Intelligent Cities through Continuous Operations

By Bo Song, President, Marketing and Solution Sales Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

In recent years, there is a trend emerging: Cities around the world are being transformed by Intelligent City initiatives. Government management standards and public services have improved drastically as a result, reshaping every aspect of life in those cities. The continuous operations of Intelligent Cities play a critical role in achieving their goals: from sustainable development and improving governance, to enhancing residents' benefits, driving business prosperity, and maintaining a high standard for management and services.

More than 600 cities in China have plans to transform into Intelligent Cities. Discovering best practices of how to run Intelligent Cities, with order and organization, will provide enormous value to the country as a whole. In addition to building Information and Communications Technology (ICT) infrastructure, Huawei offers high quality services in the planning and design of Intelligent City operations, as well as operational support services. Together with trusted partners, Huawei also provides operations management services for customers to further the sustainable development of Intelligent Cities.

## From Inception to Maturity: the Scope of Sustainable Intelligent City Operations

During the construction phase, some Intelligent City projects focus too much on the presentation of government services, the application of new technologies and products, and the replacement of old facilities

and equipment — neglecting the need for the continuous operations of systems, services, and data. In the end, such projects fail to yield the desired results. Invariably in these cases, the Intelligent Operations Center (IOC) is not put to full use and its potential is wasted. It is the lack of planning in the construction period that is the root cause, leading to difficulties in the management and operations of Intelligent Cities. Sustainable operations must be a part of the top-level design and closely monitored during the entire construction period. The design should not only take into account the present; it must also be forward-looking, to ensure sustainable operations in the future.

From the very beginning to completion, a wide range of factors must be considered, including access management, infrastructure maintenance, security management, resource management, service operations, data operations, and joint innovation (see Figure 1).

Because of the differences in their development levels, project

**The sustainable operations of Intelligent Cities must start from the top-level, with full consideration given to the construction plan during the construction period. Huawei provides the ICT infrastructure and high quality services in the planning and design of Intelligent City operations, as well as operational support services, driving the sustainable development of Intelligent Cities.**

positioning, and operations objectives, the scope of sustainable operations varies from city to city. Huawei tailors to the specific needs of individual cities by offering fully customized services. For example, in a traditional IOC project, sustainable operations focus on access management, infrastructure maintenance, security management, resource management, and service operations, as well as the implementation of advanced technologies such as data analysis and application development. In big data projects, data operations and joint innovation can be used to realize cross-department service innovation and study government data and application services.

### **Comprehensive Planning + Professional Management + Support Services: Huawei's Core Value in Intelligent City Operations**

#### **• Comprehensive Planning: Taking Both Construction and Operations into Account in a Unified Plan**

As the saying goes, well begun is half done. In the early phase of planning for Intelligent City operations, related management systems need to be deployed to facilitate subsequent operations and improve operational efficiency. For example:

- Automatic access control and attendance systems, access control devices, and self-service card issuing devices can be deployed to facilitate access management.
- Deploying a unified network management system and automatic inspection tools facilitate infrastructure maintenance.
- During the design of the service systems, secondary development capabilities should be considered, which will facilitate the flexible deployment and customization of services in the future.
- Designing data governance capability and introducing the development and innovation platform will facilitate data operations

and innovation.

If construction and operations are not considered in such a comprehensive way from the very beginning, subsequent Intelligent City operations will be far more difficult. Indeed, it would be technically and financially challenging, and prohibitively expensive to try to achieve the goals I have just outlined without implementing an overall design very early on in the construction period. Huawei has project experience in multiple countries and cities around the world, and is capable of looking at the big picture to make such a comprehensive plan. In short, operations should play a vital role in the overall planning of Intelligent City construction.

#### **• Professional Management: Make Full Use of Our Technological Strengths**

Different manufacturers excel in different aspects of Intelligent City operations. Customers are free to choose one or many to work with, focusing on their own needs and positioning. Yet, Huawei can help, bringing together the most suitable partners to cooperate on the design of Intelligent City operations.

- For access management, Huawei cooperates with local enterprises and institutions with good government relations to provide reliable services. Access to a city's IOC for sensitive personnel is therefore effectively managed, ensuring data confidentiality.
- Service operations are closely linked to the construction of service systems. Therefore, construction partners should also be involved in long-term operations.
- With Huawei's expertise in building ICT infrastructure, partners gain an edge in maintaining ICT infrastructure, and in managing resources and security.
- For data analysis and joint innovation, Huawei provides a



**Huawei HiCity operations solution has been applied in numerous projects. Huawei is driving the implementation of operations projects for Intelligent Cities in China and beyond, promoting the healthy and sustainable development of Intelligent Cities worldwide. >>**

powerful industry enablement and innovation platform, attracting partners to develop apps on the platform, reusing data and providing data services and applications externally. Huawei also provides support and enablement training for data operations and joint innovation for both customers and partners.

**• Support Services: Building a Foundation for the Digital World**

Data is the most important asset for an Intelligent City. Huawei’s industry enablement and innovation platform is based on the cloud, integrating the latest ICT technologies such as video, Internet of Things (IoT), big data, and Geographic Information System (GIS). It also integrates internal data to provide various services externally, enabling service collaboration and agile innovation. With years of experience in the field of digital transformation, Huawei built this platform to serve as the foundation for the digital world.

- The enablement and innovation platform provides integration enablement services and efficient integration capabilities for data, APIs, messaging, and devices. It also facilitates downstream connection.
- The enablement and innovation platform provides

application enablement services and enables upstream partners to perform quick development, flexible deployment, and quick rollout of applications.

Based on the enablement and innovation platform, Huawei offers professional operations support services and provides partners with technical support in platform development, training, and marketing. This helps lower the threshold for customers and partners to adopt new technologies, unlocks the potential of data assets, and allows for quick system integration and application development. Huawei manages all the complexity to provide simplicity to customers, and is fully committed to ensuring the sustainable operations of Intelligent Cities.

**Promoting the Implementation of Intelligent City Operations Projects**

Huawei HiCity operations solution has been applied in numerous projects, such as the IOC project in Shenzhen and the data innovation platform project in Zhangjiagang. Huawei is driving the implementation of operations projects for Intelligent Cities in China and beyond, promoting the healthy and sustainable development of Intelligent Cities worldwide. ▲

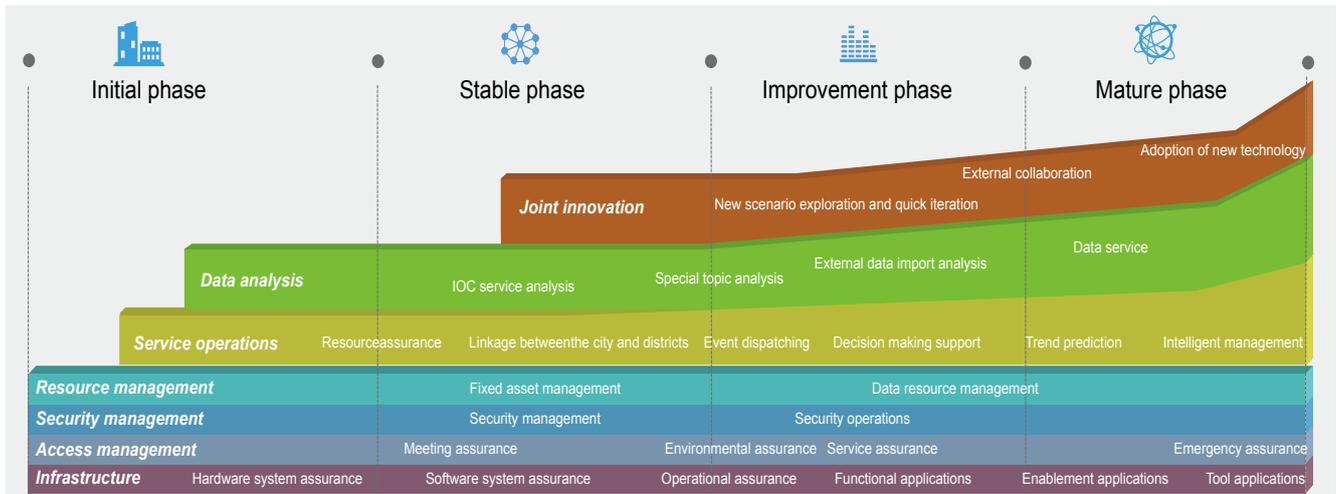


Figure 1. Scope of sustainable Intelligent City operations



# Industry Enablement Platform: Building a Comprehensive Intelligent City Ecosystem

**By** Chang Aiping, Platform Operation Department, Marketing & Solution Sales Department, Enterprise Business Group, Huawei Technologies Co., Ltd.

**D**uring the digital transformation process of governments and enterprises, collaboration, sharing, and openness between all levels are key. Therefore, a platform is required to achieve collaboration and sharing, to streamline service processes and share service data, and to transmit information flows.

Gartner analyst John-David Lovelock said that in 2019, as companies are turning to the pay-per-use model, Software as a Service (SaaS) will boost companies' software spending by 8.3 percent year on year. As a result of digital transformation, IT services will grow by 4.7 percent from 2018. As more and more enterprises start to adopt cloud computing, expenditure on data center systems will increase by 1.6 percent compared to last year.

Meanwhile, according to Gartner's global survey on CEOs, 63 percent believe that they will change their current business model and promote digital transformation within the next three years. Collaboration between IT and business is key to ensuring that digital projects can create value for enterprises.

Against this backdrop, Huawei has developed an industry enablement platform based on its infrastructure capabilities combined with emerging technologies such as cloud computing, big data, and Artificial Intelligence (AI). The platform aims to build a comprehensive ecosystem for cooperation that helps governments at all levels improve

communication efficiency to enhance the management mechanism, provide open and transparent information, and offer convenient and efficient services. It helps cities achieve digital transformation and intelligent construction, and ultimately stability.

## Who Does the Enablement Platform Help?

The enablement platform's success is determined by the success of its customers. Meanwhile, customers' success depends on vendors having years of experience in service fields and mature service application systems. The enablement platform benefits these professional service system vendors as it aims to make full use of their accumulated experience and capabilities in the professional business domain.

Professional service vendors have capabilities in a particular field, but they often lack capabilities in other fields. Therefore, the enablement platform allows professional vendors to streamline business processes and data in the siloed system horizontally while

**The industry enablement platform aims to build a complete ecosystem for the intelligent construction and digital transformation of cities, establish a healthy and autonomous ecosystem, and develop diversified application systems. With this infrastructure in place, application systems can feed back to the ecosystem — making it healthier and more dynamic.**

enriching platform capabilities vertically, and providing strong support for service innovation.

During the reform of the government department system in China, new government organizations, such as the government service data management bureau and emergency management bureau, were set up. These new organizations have issued unified construction tasks and specifications for service system construction; the application construction must be planned systematically, and the application implementation must be standardized and regulated in the same way. In this context, the platform can centrally manage the construction of business applications — achieving consistent planning and placing similar constraints on the development of business systems.

### How Does the Enablement Platform Enable?

- **Data Enablement: Transferring the Value of Data to the Application Developer**

If data can be compared with the oil in cities, then the siloed service systems built by governments are similar to oil fields. Commodities are only valuable in trading, and the value of oil can only be realized in its energy form. Therefore, we have to figure out how extract the oil from these oil fields. This has become a major problem for all levels of government. The difficulties come from policies, regulations, rights, security, and technology — each of which forms a barrier.

The enablement platform facilitates data convergence, extracting data from siloed systems, and aggregating the data into a data lake. In addition, data can be processed, analyzed, and mined to form valuable information. Data value is transferred to application developers by providing data services externally.

Data enabling capabilities include collection, aggregation,

governance, development, data lake, data theme connection, and service. The purpose of data enablement is to enable various types of data to flow so that they can create value.

- **Application Enablement: Accumulate Business Assets and Facilitate Application Development**

Application enablement aims to accumulate core service assets based on the construction of service application systems, so that service vendors can reuse related assets when developing service application systems and form consistent application construction specifications.

From the perspective of software development, an application system includes service objects, processes, and presentation. Can the content be accumulated to form reusable assets when an application system is constructed? From a technical perspective, this is certainly feasible. Application development vendors also have requirements for reusing related capabilities, because this can help them quickly establish application systems in related service fields.

The major challenge the enablement platform faces is finding ways to accurately accumulate reusable core business assets without involving core business applications. The key to solving this problem is to provide an ecosystem that can gather core business assets of global applications to promote the transaction of application assets. This provides the consumers of such assets with a range of business applications; it can also expand the scope of business applications; and it provides potential transaction opportunities for asset producers.

Application enablement accumulates an abundance of application assets based on the preceding modes to drive exponential ecosystem growth. The ecosystem's robust growth also needs to consider the impact of many factors, but the core factor is the application asset



***Huawei's industry enablement platform has registered more than 6,000 developers and accumulated over 150 industry suites, and it supports the application development of more than 20 partners. The platform plays an important role in more than 50 projects such as Shenzhen government's big data, Zhangjiagang, Vanke, and Shenzhen Airport projects. >>***

accumulation of core service application vendors. Huawei's industry enablement platform has accumulated service capabilities and assets of 6 business objects, 2 applications, 12 connectors, 31 adapters, more than 800 Application Programming Interfaces (APIs), and 69 User Interface (UI) components from previous projects. These business assets are still being expanded and enhanced. We believe that with the development and accumulation of customer services in the future, we can provide more application enablement services.

- **Integration Enablement: Provides Multiple Integration Modes for Intelligent City Construction**

Integration enablement allows data integration, message integration, and application integration when faced with a huge number of service systems and complex service networking. The enablement platform supports multiple integration modes. During the construction of a digital Intelligent City system, the platform functions as an integrated central system to provide integration capabilities, break down the silos of service systems, eliminate isolated information and data, and implement the smooth transfer of information

and service processes, data convergence and sharing. The essence of integration enablement lies in the diversity of integration methods and the applicability in complex integration environments.

- **Development Enablement: Empowers Application Developers**

The digital transformation of governments requires the development of multiple application systems. Because the development languages, environments, application system UI styles, and system versions are different, it is difficult to consistently manage the design, development, testing, deployment, and maintenance of an application system. To solve these problems, the development enabling module provides a set of development specifications and environments for development, testing, debugging, deployment, release, and version maintenance. It can develop and deploy applications online while conveniently and efficiently upgrading and maintaining application versions.

The enablement platform provides 'fertile soil' for ecosystem growth, while development enablement empowers developers, allowing them to unleash their imagination in application system construction.

- **Vision: Be a Creator in the Digital Era**

Huawei's industry enablement platform has registered more than 6,000 developers and accumulated over 150 industry suites, and it supports the application development of more than 20 partners. The platform plays an important role in more than 50 projects, such as Shenzhen government's big data, Zhangjiagang, Vanke, and Shenzhen Airport projects.

In the future, Huawei's industry enablement platform aims to build a complete, healthy ecosystem and develop diversified application systems. ▲



Industry Enablement Platform and Industry Services launch at HUAWEI CONNECT 2018



# Ruicheng Technology: How to Achieve Smarter Urban Management Using a Digital Brain

By Wang Jiankang, General Manager of Ruicheng Technology

## What Is an Urban Digital Brain?

A digital brain acts as the ‘central nervous system’ of a Smart City, and supports decision-making, command and dispatch, and data analysis. A city’s big data is gathered from government and social data. Cross-domain data convergence and analysis enable the detection and prediction of the operating status of the city. It displays the city status in real time, provides information for emergency command, and serves as a command center for major emergencies. This is a new and innovative model for Smart City management that consolidates routine and emergency management into one system.

- **One Unified Map for Global Information: City Status**

### Detection

The digital brain accesses heterogeneous data from a multitude of sources — such as government, Internet of Things (IoT), the Internet, and carrier networks — which is then integrated, governed, analyzed, and mined to generate urban big data that reflects the city’s operating status. Using holographic big data visualization technology, a digital twin of the physical city is rendered — showing the status above ground, underground, in the air, and in the sea on one unified map — covering all service domains, such as the economy, security, transportation, ecology, public welfare, and government services.

- **One-Click Decision-Making Support for Management: Strategy Development**

Built in the Intelligent Operation Center (IOC), the digital brain

enables comprehensive decision-making analysis by integrating data and services across departments. For instance, the regional industry planning function analyzes which industries are suitable for deployment and creates supportive policies after systematically integrating a range of pertinent data in the target and surrounding areas including: upstream and downstream industry chain, carriers, talent, and infrastructure (e.g. transportation, schools, hospitals, and housing). With this data, cities can apply facts to the decision-making process.

- **Integrated, Collaborative Dispatch and Command: City Hub**

The digital brain sets up an integrated command center that covers all data, systems, and networks, enabling cross-department and cross-level command. In case of major events or emergencies, the digital brain supports information acquisition, expert consultation, solution development, emergency resource dispatch, and information transfer. With joint dispatching and integrated command of multiple departments, rescue efficiency is improved, and injuries and property losses are reduced.

- **One Screen for Intelligent Operations Command Anywhere: Cockpit for Leaders**

The digital brain features a cockpit app designed for city managers that is tailored to their individual responsibilities. With this app, managers can check the city’s operating status anytime and

**The digital brain used in Smart Cities is more than visualization software; it must also be able to change and understand service processes, with support for the collection, governance, analysis, and mining of big data. To meet these requirements, it is particularly important for us to work with outstanding partners like Huawei to build an urban digital brain.**

anywhere, and make decisions or issue commands to resolve problems in a timely manner, strengthening the city's management and improving incident response efficiency.

### How to Understand a Smart City

A Smart City cannot be built overnight. Rather, a Smart City is the product of the countless interactions and evolutions of new technologies, services, processes, mechanisms, organizations, and ideas. The history of human civilization is also the history of city evolution, with energy and information playing a key role in shaping its destiny. For millenniums, human beings have been improving the efficiency of energy and information use, going from hunting and gathering to farming to industrialization, automation, informatization, and digitalization. In Smart City projects, Ruicheng is on a mission to make data easy to understand and to enrich human-machine interactions by adding emotional intelligence to Artificial Intelligence (AI) systems. Ideally, people should feel comfortable with data, enabling humans to progress alongside machines.

City development issues cannot be resolved by technology alone; they require a process of continuous improvement that is aided by technology. As for the design of the digital brain, Ruicheng's approach is to strive to understand services and people and match them with suitable products and technologies. Continuous learning is key, and Ruicheng strives to understand industries even better than industry insiders. In addition, by capitalizing on Ruicheng's technical strength in big data visualization, customers can get an intuitive understanding of the data and grasp service development trends through visualization. Once managers truly understand the data, they can anticipate issues, risks, and trends to make fact-based decisions.

The digital brain is an innovative solution in the industry. Therefore, it is critical to collaborate with outstanding partners to build the city's digital brain. The digital brain used in Smart Cities is more than visualization software; it must also be able to change and understand service processes, with support for the collection, governance, analysis, and mining of big data.

### How to Build a Digital Brain

Within two years, Ruicheng, together with Huawei, has provided digital brain solutions and products to more than 30 cities worldwide, giving strong support for effective and efficient governance in these cities.

- **Beijing Yanqing District: City Service Management**

#### Platform Safeguards International Horticultural Exhibition

Yanqing District's city service management platform is oriented toward transportation and tourists — and follows the '1 + 9 + X + Y' principle. That is, based on Yanqing's informatization construction status, the district has constructed one city service management platform; integrated nine industry systems (e.g. smart transportation and smart tourism); aggregated data of X key domains; and accessed Y types of urban and social data. In this way, informatization projects are accessed and managed centrally, systems are integrated across departments and services, and data is interconnected more efficiently. Based on the district-level big data platform, the center provides functions such as situation awareness, decision-making analysis, and collaborative command, supporting the stable operation of Yanqing.

Yanqing hosted the *International Horticultural Exhibition* in 2019 with visitors from all over the world. This major event places enormous strain on urban management. To ensure smooth operations,



*Within two years, Ruicheng, together with Huawei, has provided digital brain solutions and products to more than 30 cities worldwide, giving strong support for effective and efficient governance in these cities. >>*

Yanqing improved its management system for pedestrians and vehicles within the jurisdiction, and enhanced comprehensive management capabilities and services.

The Yanqing project employs Ruicheng's big data visualization and Huawei's converged communications technology to enable collaborative command and incident management between junior grid administrators and the command center, accelerating incident processing in the city.

• **Big Data in Guizhou Province: 'One Cloud, One Network, and One Platform' Improve Government Service Capabilities**

As China's first comprehensive big data pilot area, Guizhou has introduced pilot initiatives such as data sharing and innovative big data applications. The province has also proposed a goal to create 'One Cloud, One Network, and One Platform.'

'One Cloud' refers to one Guizhou cloud that collects all government data across the province. The On-Cloud Guizhou System stores, shares, and develops data centrally, allowing data to easily move from the cloud to government, civilian, and commercial applications. To date, the cloud has supported 9,730 application systems from provincial, municipal, and county-level departments, and stored 1,610 TB of data.

'One Network' refers to one network for government services. It integrates service systems from governments at all levels to facilitate data sharing, unifying government services on one network. The one-network service window is open to both enterprises and residents — enhancing online public service capabilities and improving application processing efficiency. Guizhou's eGovernment service network consists of two parts: physical and logical networks. In terms of physical network construction, the eGovernment network covers four levels: province, city, county, and town, and will

extend to villages by the end of 2019. As for logical network construction, government service centers at provincial, municipal, county, town, and village levels can query and process 588,000 government service items on PCs; the On-Cloud Guizhou app offers over 430 common government services to the public.

'One Platform' refers to one intelligent work platform that covers government services and data governance. For government services, data sharing has enabled parallel processing of administrative approvals, replacing the outdated sequential method. For data governance, data resources from all departments are integrated into one, with over 12,000 data directories and 200,000 information items added on the platform already. The integrated platform schedules data across layers, regions, and departments in the province, maximizing the value of data through utility and sharing.

Guizhou's 'One Cloud, One Network, and One Platform' project is created based on data governance, implementing government data aggregation, convergence, and application. This project aims to provide convenient and fast services to enterprises and the public by eliminating information and data silos. Incorporating big data technologies into social governance, public welfare services, real economy, and rural revitalization would further enhance the government's capabilities.

With so much at stake, Guizhou has very high standards for the vendor's multi-system and big data capabilities. To fulfill the project's requirements, Huawei helped Guizhou easily integrate and converge multi-source data through Huawei Horizon Digital Platform. Meanwhile, Ruicheng enabled Guizhou to integrate, analyze, and use 9,730 application systems and 1,610 TB of data by leveraging the big data visualization platform. ▲



Brand-new CloudEngine S-Series  
the Ideal Campus Switch for Wi-Fi 6 Era  
Powered by Huawei Solar Switch Chipset

Building a Fully Connected, Intelligent World





# BONC: Consolidating the Foundation of City Data and Improving Data Application Capabilities

By Wang Chao, Director, City Intelligence and Big Data Research Center, BONC

**S**mart City construction is driving urban industry development and creating urban vitality. City managers have reached a consensus on communicating, decision-making, managing, and innovating with data. They believe that a systematic and powerful urban big data center is a necessity in building a new type of Smart City with deep insights, efficient governance, industry prosperity, and enhanced public welfare.

## What Data Capabilities Do Smart Cities Need?

New technologies — 5G, Internet of Things (IoT), big data, cloud computing, and Artificial Intelligence (AI) — are gaining popularity. This trend contributes to more convenient data acquisition methods, diverse data collection approaches, higher data reliability and security requirements, and various data sharing and application approaches. To keep pace, the urban big data center — featuring multi-department aggregation, cross-department sharing, and multi-layer application — needs to perform systematic construction and operations in the following aspects:

- **Data resource planning:** In addition to the sharing of government data and geographical data, it must consider the collection and aggregation of IoT, video networks, and Internet data, and continuously optimize the entire data architecture.
- **Platform architecture construction:** Consider storage flexibility during mass data collection, as well as processing engines and

integration modes of different types of data, such as the real-time IoT stream data processing engine and the geographical big data processing engine.

- **Data governance and control:** Implement End-to-End (E2E) integrated management of data sources, warehouses, products, and services, as well as catalog and metadata management. Specifically, this covers the standards layer, data layer, metadata layer, data resource catalog, data mapping rule, quality audit rule, data handling process, and data tag management.
- **Data analysis and mining:** Focus on application objectives and themes to flexibly support ‘drag-and-drop’ data modeling capabilities.
- **Data openness and sharing:** Provide multiple data interfaces and data openness capabilities, including resource catalogs, data tags, data indicators, and themed applications. Smart Cities must also focus on opening up service interfaces (Application Programming

**Business-Intelligence of Oriental Nations Corporation (BONC) develops solutions with Huawei by mutual enablement on Huawei Horizon Digital Platform. Together they create and optimize the data foundation for Smart Cities, provide solid data capabilities for the governments' big data platforms and Intelligent Operation Centers (IOCs), and fully unleash the application value of city big data.**

Interfaces) and WeChat city services.

- **Data services:** When data center capabilities are used across departments and layers, Smart Cities must provide cloud-based data governance, analysis, mining, and data service provisioning capabilities.

### **Huawei and BONC Enable Each Other Using Huawei Horizon Digital Platform and Big Data Tools**

Massive amounts of heterogeneous urban big data involve multiple departments, regions, and sources. Huawei connects Huawei Horizon Digital Platform to BONC's government data sharing platform and basic geographic information sharing platform, enabling the two parties. This enhances data resource planning, cloud-based data governance, big data analysis and mining, and diverse data product and service capabilities, which has been verified in the IOC and government big data projects.

#### **• Huawei's Digital Foundation for Smart Cities**

Based on the cloud, Huawei Horizon Digital Platform integrates new ICT and various types of data to connect the physical and digital worlds. The digital platform is the core of the digital foundation and enables data aggregation, data intelligence, and data-based operations.

- **Data convergence:** Integrates heterogeneous data from multiple sources to unify data and build a unified data foundation. Provides data planning and model building services oriented to industry scenarios to realize data value mining and sharing.

- **Service collaboration:** Streamlines applications and implements connection and collaboration across service systems, regions, and clouds through the Real-Time Open Multi-Cloud Agile (ROMA)

platform. Achieves capability convergence, collaboration, and sharing through service-based ICT capabilities and service orchestration.

- **Agile innovation:** Offers an efficient application development environment and builds a development service platform for agile business development through ABC. Introduces innovative common applications, integrates and optimizes partners' super applications, and invites partners to join the marketplace to form an innovative ecosystem.

- **Inclusive AI and security:** Provides inclusive AI services based on its full-stack, all-scenario AI capabilities. Device-cloud synergy and AI are used to defend against attacks and eliminate threats, ensuring reliable security. Multi-cloud management and disaster recovery backup support business continuity.

#### **• Joint Big Data Solution by Huawei and BONC**

The joint solution has the following features:

- Embraces Huawei Horizon Digital Platform's strengths in big data infrastructure, video cloud, and IoT platforms, in accordance with the characteristics of government and urban big data. Invokes BONC's big data governance, management, analysis, and mining, as well as Business Intelligence (BI) tools to improve platform architecture and data governance and application capabilities.

- Adheres to the 'data lake' concept. Based on data governance engineering of the central database, it streamlines the relationship among the aggregation database, central database, basic database, specialized database, and shared database, to strengthen E2E urban data governance capabilities.

- Simplifies the management interfaces of major customers



***The construction of an urban big data center is a complex, long-term process that requires sustainability. Starting with the building of a data resource planning system, the project needs to plan the whole process from data aggregation to data supply, covering data source, collection, exchange, governance, mining, service, and application. >>***

such as big data bureaus and data resource centers. Generates one unified diagram for big data operations management and monitoring, one diagram for data assets, and regularly produces data operation reports and data quality reports at different levels of the data warehouse, allowing users to intuitively manage and control complex data center operations.

- Expands big data analysis and mining capabilities. Builds data models and big data analysis models in drag-and-drop mode based on application requirements. Integrates data and algorithm models to meet decision-making and analysis requirements.
- Capitalizes on Huawei Horizon Digital Platform's cloud capabilities to fulfill data governance requirements of cities and government departments and support cloud-based data governance, data cleansing, and governance audits.
- Supports data sharing among multiple departments, and zero-code data service release. Centrally manages data interface services in data marts, enhancing data service supply capabilities.

### **Establishing and Improving a Data Resource Planning System**

The construction of an urban big data center is a complex, long-term process that requires sustainability. Starting with the building of a data resource planning system, the project needs to plan the whole process from data aggregation to data supply, covering data source, collection, exchange, governance, mining, service, and application. In addition, the planning of the data source, data resource, platform, and application layers should be considered.

- **Data source layer:** The government data sharing platform and basic geographic public information service platform are two important sources of government data. This layer also accesses structured

data of video networks, real-time stream data of city monitoring and surveillance IoT networks, Internet public opinion data, mobile Internet location data, and consumption data. In addition, applications for urban fields should support the planning and accessing of new types of data sources.

- **Data resource layer:** Consider the classified/hierarchical planning and design of the data source, aggregation database, central database, basic database, specialized database, and shared database. Plan the data entity, metadata database, data resource catalog, indicator database, and tag database.
- **Data platform layer:** Based on the data access environment and conditions, centrally plan the big data infrastructure platform, Geographic Information System (GIS) data processing engine, video data structure engine, IoT data access and processing engine, unified data collection platform, urban big data governance platform, big data analysis and mining platform, and comprehensive urban big data display and BI platform.
- **Data application layer:** Plan and construct the indicator library, tag library, model library, and data service mart to support four applications: data sharing, data query and authentication, themed big data application, and data product mart (portal).

### **Building an E2E Data Governance and Management System**

The urban big data center accesses complex and diverse types of data. To ensure that trustworthy data and services are offered to government departments, enterprises, and people, the center should establish an E2E data governance and management system spanning from data collection to data supply. The following aspects need to be considered: standards and specifications system, data governance system, data governance engineering, and data management.

- **Standards and specifications system**



***Huawei and BONC enable each other using Horizon and big data capabilities. Together, they develop joint solutions, install a big-data-based city 'brain' in the IOC, and support government big data platform projects by offering data engineering services such as data collection, central database construction, full-process data governance, and themed large-screen data interfaces. >>***

**establishment:** Standards and specifications are the premise of constructing an urban big data center. A set of standards, specifications, and management regulations is required, in compliance with national and industry standards. The process for creating the specification includes streamlining, development, verification, review, release, and update. It involves data source interface specifications, metadata specifications, data resource catalog specifications, database design specifications, data governance rules, and data service interface specifications. Data management mechanisms and regulations are also included.

- **Data governance system establishment:** Establish a comprehensive data governance and management system for all data managed by the city big data center, to enable data model standardization, relationship clarification, processing visualization, quality measurement, and service automation. Using metadata management tools as the core, a data governance system is constructed to manage metadata, resource catalogs, data handling processes, and data work orders in a closed-loop.

- **Data governance engineering service:** To ensure data from the urban big data center is high-quality and authoritative, each government department governs its own data and checks its quality. The whole process begins with defining the data scope based on service requirements, analyzing the data source access environment and informatization environment, and evaluating original data quality and detecting issues. The next step is to specify data quality audit rules, data integration processing rules, and their mapping relationships. Then the service rules are converted into technical rules and processes, and they then execute data processing and audit tasks. The next task is to monitor task execution results,

and analyze and assess issues. Problematic data is then sent back to government departments for improvement. Government departments optimize data handling processes based on issues detected and audit reports. Finally, data service products are developed to meet data sharing and openness requirements — and released with ‘zero code.’

- **Data management system establishment and improvement:** The role-based management view is provided for data managers, data handlers, and department users. Data managers need a unified diagram that displays data exchange and aggregation, data processing, quality audit, work orders, overall running status of data services and release, and center-wide data asset reports. For data handlers, the unified view should present data handling process reports, quality audit reports, metadata-based data object query, basic information, handling process, lineage, and quality reports of data objects, as well as data service interface status. For government department users, the management view should contain the data source interface catalog, subscribed data service interface catalog, cloud-based data governance platform, and data service mart.

### **Building a Drag-and-Drop Big Data Analysis and Mining System**

Big data technologies are widely applied to analyze and predict urban issues, as well as assess a city’s operating status and policy effects. For example, mobile location data can help monitor, analyze, and predict urban foot traffic and logistics; land and real estate price data is used to predict and evaluate the economic vitality of urban real estate; and environmental monitoring data supports urban environment quality analysis and assessment. Considering these analysis, prediction, mining, and application requirements in urban management

and governance, cities should build an on-demand big data analysis and mining system.

Focusing on urban and government applications, the system should provide data analysis, mining, and modeling capabilities such as data statistics, indicator analysis, tag analysis, tag profiling, model exploration, algorithm application, themed analysis, and analysis reports. The system construction project consists of three aspects: indicator and model library construction, cloud-based analysis and mining platform (AI platform) construction, as well as model visualization and application.

- **Indicator and model library construction:** Construct the indicator library, tag library, algorithm library, model library, themed application template library, and analysis report template library based on urban management and government application themes.

- **Cloud-based analysis and mining platform:** Provide a cloud tenant service mode for government departments and users at all levels, allowing them to use operators, algorithms, modeling, calculation, and visualization tools and capabilities on the analysis and mining platform. The platform supports visualized analysis model creation in drag-and-drop mode, and provides basic, collaborative, and closed-loop modeling and process management regulations. The regulations apply to data preparation, access, and processing, as well as model creation, training, evaluation, inference, deployment, go-online, and cloudification services.

- **Model visualization and application:** Visualized model orchestration enables users to manage and control the process of creating segment-based or exploratory models, and visualizes model analysis results using charts, dashboards, maps, and heat maps.

### Building a Cloud-Based Data Service System

Portal-based data sharing and service interfaces should be provided by the urban big data center. Moreover, multiple important data services are interconnected, such as the city app service, themed large-screen display service, and

authorized credit data query service. Therefore, building a cloud-based, systematic data service portal based on Huawei Horizon Digital Platform is the key to data center vitality and sustainability. This involves a unified data service portal and background management of the data service mart.

- **Unified data service portal:** Provide government departments, enterprises, and residents with a multi-level and multi-way data service portal involving data service portals, data service apps, and WeChat official accounts. This unified portal offers the following functions: data exchange and download, data service interfaces, tag-based data sharing, themed large-screen display, connection to city apps, and authorized credit data query service.

- **Data service mart:** Implement integrated background management for flexible data services, including data query, data service and product interface registration, service management, resource scheduling, service usage monitoring, as well as data service measurement and charging.

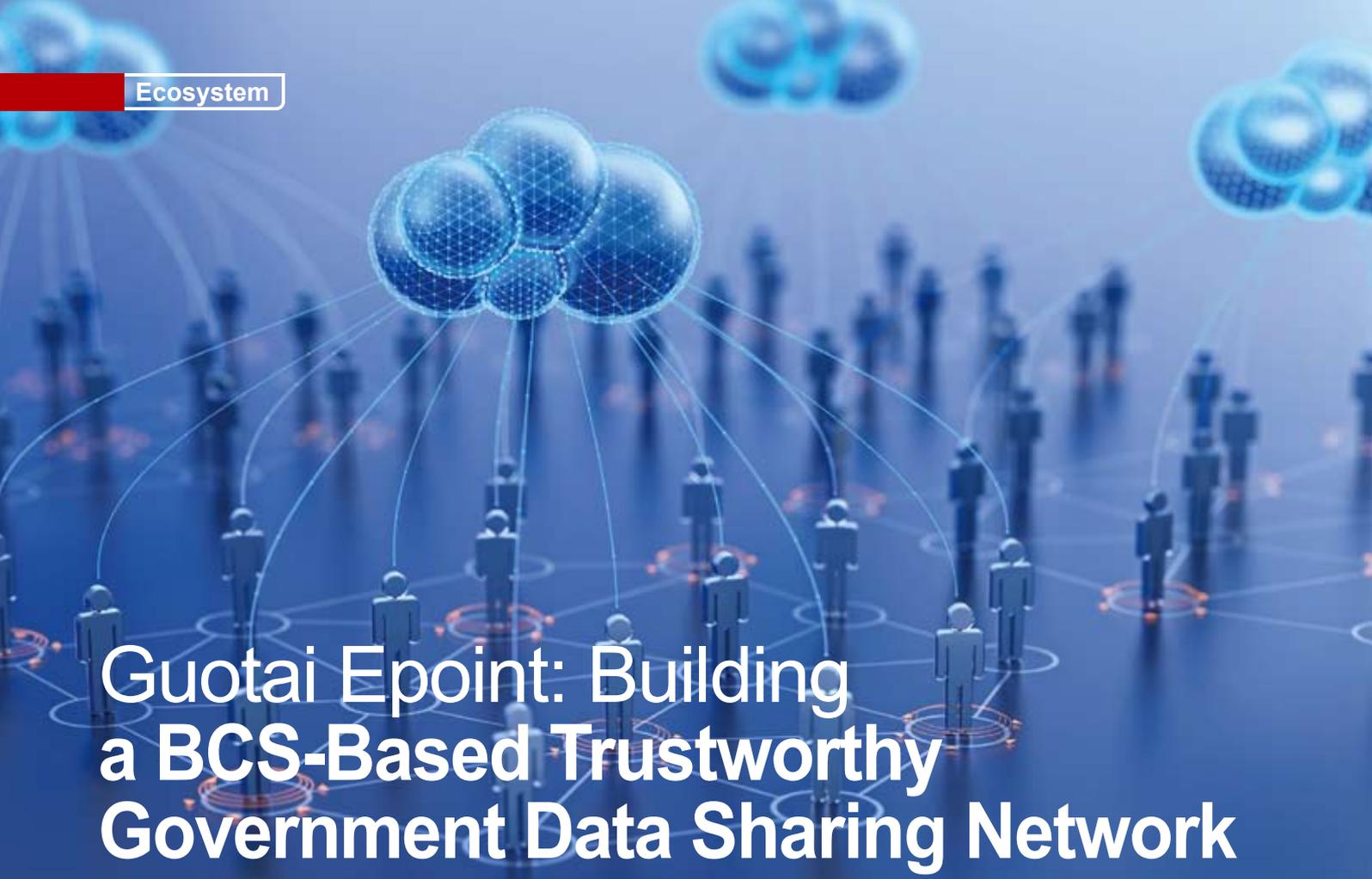
### Contributing to Smart City Construction in China Using Joint Innovation

Huawei and BONC enable each other using Horizon and big data capabilities. Together, they develop joint solutions, install a big-data-based city ‘brain’ in the IOC, and support government big data platform projects by offering data engineering services such as data collection, central database construction, full-process data governance, and themed large-screen data interfaces. The joint solution has been deployed in more than 20 projects across Beijing, Shanghai, Shenzhen, Tianjin, and Shandong.

Huawei is committed to building a prosperous digital economy ecosystem and supporting Smart City construction in China. As a strong partner of Huawei’s ‘Robust Ecosystem Program,’ BONC has collaborated extensively with Huawei. The two parties have worked together to innovate and to enable each other in fields such as Smart City and big data. Together, they will make a great contribution to China’s Smart City construction — changing people’s lives with data and creating a better future. ▲



# AirEngine Wi-Fi 6 Powered by Huawei 5G



# Guotai Epoint: Building a BCS-Based Trustworthy Government Data Sharing Network

By Yao Ming, Director of the Consulting and Research Center, Jiangsu Guotai Epoint Software Co., Ltd.

It may seem like an independent technology, but blockchain is in fact an organic combination of a series of mature technologies with multi-party writing, joint maintenance, ledger sharing, decentralization, and anti-tampering features. Distributed accounting — a concept introduced by blockchain — serves electronic cash transactions, or in a broader sense, processes value transfers. Theoretically, blockchain technologies can be used to record and track the ownership and circulation of various tangible and intangible assets, and complete point-to-point value exchange.

The Beijing government initiated the collection of government service data through aerial photography in 2001, launched the government department directory in 2005, and established the municipal/district data sharing and switching system in 2016. Then, in 2017, it released the *Beijing Government Service Data Resource Management Regulations (Provisional)*, before aggregating two batches of government service data (with 13 themes) through the big data action plan in 2018, and in 2019, began construction of level-3 directories. Beijing undoubtedly leads the exploration of government service data application in China.

## **New Challenges Posed by the Increasing Number of Government Service Information Resources**

With the rapid development of new technologies — such as cloud computing, big data, and blockchain — the focus of government informatization has shifted, from applying government service

information, to improving the management of the information itself. Key management approaches now include optimizing government service processes, promoting the sharing and switching of government service data, and mining, analyzing, and visualizing government service data. However, the emergence of a huge quantity of government service information has created new challenges in terms of managing the data. The first challenge concerns resolving the issues of insufficient coverage and untimely updates of the resource directory. Meanwhile, the second focuses on how to link the resource directory with department data in real time. A third challenge then focuses on how to support the data sharing mechanism and ensure the desired quality of shared data. Tackling these issues has become the key to optimizing government service resource management.

Back in 2006, Beijing had already built a municipal/district sharing and switching platform — which covered all 16 districts and

**Guotai Epoint and Huawei collaborated on the Beijing Government Service Resource Directory Chain Solution, integrated Huawei's Blockchain Service (BCS) with Epoint's experience in government big data, and built a blockchain-based trusted data sharing network within the government, effectively meeting the needs for secure data sharing between government departments.**

69 municipal departments — interconnecting this platform with the national sharing and switching platform. However, the platform only functioned as a switching channel and did not store data. Moreover, data switching and the directory were disconnected, and only limited data was shared and exchanged. To solve these problems, the Beijing Party Committee and municipal government released a series of policies, including the *Beijing Big Data and Cloud Computing Development Action Plan (2016–2020)*, and the *Beijing Government Service Information Resource Management Measures (Provisional)*, initiating the construction of level-3 directories in 2019.

### **The Huawei Epoint Directory Chain Co-Innovation Solution**

The Huawei-Epoint Directory Chain Co-Innovation Solution is based on Huawei BCS; it is open, easy to use, flexible, efficient, cost-effective, and secure. The solution designs an overall plan for managing resource directory data based on customer requirements, and creates accounts personalized for them. In this instance, it has also organized an alliance directory chain that is co-managed by the Office of the Organizational Setup Committee, the Beijing Municipal Finance Bureau, and the Beijing Municipal Bureau of Economy and Information Technology. Any changes to key services must be reviewed by these three parties. Departments, offices, and bureaus can be invited to join the directory chain and access it by deploying front-end processors. The mapping from the database tables to

the directory chain is executed based on the unified rules of the resource directory.

Epoint provides the upper-layer applications of the blockchain directory system. The reconstruction of the resource directory management system is completed using Epoint's extensive experience working with government big data and Huawei's cloud blockchain technology platform. Problems such as an incomplete directory, inconsistency between directory and data, random directory changes, indiscreet authorization, and untimely data updates are tackled as a priority. In the meantime, the solution further improves the smart contract system and the probe system, making the directory more visible, reliable, available, and assessable. It achieves a close association between data and responsibility, preventing tampering by locking the link between the responsibility directory and data directory. The solution also implements multi-party service negotiation based on consensus and the smart contract system, using the Huawei cloud blockchain technology platform as the unified data access entrance. In addition, a data probe is used to monitor data changes in real time, ensuring the consistency between data and the directory.

As the underlying technology, the Huawei cloud blockchain platform introduces blockchain technologies to solve issues in the traditional sharing and switching mode, including the risk of data tampering, untimely data updates, and the difficulty of assuring data validity. Moreover, the platform



***Epoint and Huawei's cooperation in the Beijing Government Service Resource Directory Chain Solution is an example of deep convergence between new ICT and government services, boosting both parties' innovation capabilities and service quality. >>***

adopts innovative technologies — such as a layered architecture, optimized consensus algorithm, container, microservice architecture, and scalable distributed cloud storage — to address the prominent issues of the directory system surrounding system performance, function completeness, system scalability, and ease of use. In terms of security, HUAWEI CLOUD Security provides support for the nodes, account books, smart contracts, and upper-layer applications of the blockchain.

#### **Application Results of Blockchain Technologies in the Government Service Information Resource Directory System**

The co-innovation solution satisfies the requirements of distributed management, unified view, non-tampering, and dynamic authorization and control of the resource (responsibility) directory, as well as supporting future scalability.

Beijing has completed the responsibility directory reviews of 31 municipal departments, issued the *Beijing Directory Chain Management Regulations (Provisional)* to all district and municipal departments, and 'linked up' and assigned codes to the reviewed responsibility directories of 31 municipal departments. Meanwhile, Beijing has initialized the information systems and data directories of each department and district on the chain.

The co-innovation solution supports the Beijing government service resource information directories in three ways:

- **Full coverage and timely update of government service resource information directories.** After blockchain technologies are introduced, departments organize data resources based on their responsibilities, in preparation for sharing. They then record the information resource directories of shared data on the shared account book of the

blockchain. As a node of the blockchain alliance, each department stores the shared information resource directories of all departments as well as the release and change records. Any record of change can be tracked according to audit requirements.

- **Close association between government service resource information directories and government service data.** The introduction of the blockchain helps reconstruct the shared information resource directories of government departments and builds blockchain-based trustworthy data sharing networks within government. This network is the foundation for building a flat sharing and switching mechanism according to the requirements of each department. The shared and switched data of various departments and the information resource directories form two interconnected blockchain alliance chains, meeting the requirement for secure cross-department data sharing.

- **Improved data sharing mechanism and increasingly high quality government service data.** The policy of a shared account book, alongside multi-party endorsement of blockchain, can prevent data providers from altering data without authorization. Moreover, data on blockchain nodes includes all records of historical releases and changes, enabling historical records to be tracked based on time stamps.

Epoin and Huawei's cooperation in the Beijing Government Service Resource Directory Chain Solution is an example of deep convergence between new ICT and government services, boosting both parties' innovation capabilities and service quality. In the future, Epoin and Huawei will focus on customer requirement changes, service development needs, and the latest technological trends, to further integrate resources and continuously optimize the joint solution — creating a better overall customer experience. ▲

# Telchina: Huawei Horizon Digital Platform Makes 'Grid+' Urban Management More Intelligent

By Liu Ke, General Manager, Consulting and Planning Department, Telchina Smart Industry Group Co., Ltd.

The digital and intelligent transformation of various industries is in full swing, integrating new technologies, such as cloud computing, big data, Internet of Things (IoT), and Artificial Intelligence (AI). By offering ubiquitous connectivity, pervasive intelligence, and Huawei Horizon Digital Platform, Huawei is helping enterprises capture the emerging opportunities. On the upper level, Huawei supports rapid application development and flexible deployment, enabling agile innovation of services in various industries. At the base level, Huawei's 'cloud-pipe-device' synergy is achieved through ubiquitous connectivity, bridging the physical world with the digital world. Huawei Horizon Digital Platform serves as the foundation for digital transformation, enabling data aggregation, data intelligence, and data-based operations.

Telchina Smart Industry Group is now a leader in Smart City development and urban management, sustaining a competitive advantage through its extensive project experience, technical strength, and customer service capabilities. By working closely with Huawei, Telchina has developed the 'Grid+' urban management platform based on Huawei Horizon Digital Platform. The collaborative project ensures that Telchina's smart solutions and services are improved, while also providing the potential to design and develop new Smart Cities.

## 'Grid+': A New Model for Urban Grid Management and Services

Proposed by Telchina, 'Grid+' is a new urban grid management and service model based on the 'Internet+' concept (the application of information technology in conventional industries). The 'grid + N'

principle, where N represents management services in various fields, is designed to meet grid requirements for urban management and services. Consequently, the government's management model has changed from one that is reactive and problem-centric to one that prioritizes prevention and service improvement.

The new model expands grid management from simply detecting and resolving urban management issues to grid-based, refined urban management and services — all using the same platform. Adhering to the concept of proactive management, the government sorts urban issues based on existing urban challenges. Functional departments then produce management and service lists; actively develop countermeasures; and prevent issues from reoccurring. Additionally, the new model extends communication channels between the government and the public, using the public to identify issues and supervise grid management and service. The new model

**Through in-depth collaboration with Huawei, Telchina has developed the ‘Grid+’ urban management platform using Huawei Horizon Digital Platform. This has improved the competitiveness of Telchina’s smart solutions and services, and supported the construction and development of new types of Smart Cities.**

establishes four grid management and service systems: grid + public needs; grid + proactive management; grid + proactive services; and grid + supervision and appraisal — creating a ‘grid + N’ smart urban management and service model. The government is committed to optimizing urban management and services, realizing refined management, and improving the living standards for residents.

- **‘Grid+’ Urban Management Platform Unifies Public ‘Grid+’ Mechanisms to Avoid Construction Faults**

Based on the unified grid division standards, the unified grid platform serves multiple purposes and facilitates data sharing. By using the cloud computing service architecture, each department can establish customized grid management systems by managing its rights and configuring basic services. The platform can create dedicated management systems, such as ‘grid + city management,’ ‘grid + social management,’ and ‘grid + community applications.’ Taken together, a multi-level ‘grid + N’ management system is formed, covering the whole city or county.

In the ‘grid + department’ module, each department specifies the responsibilities in its management and service lists, with the manager specified in the ‘grid + person’ module. In addition, an issue list enables grid administrators to delegate issues to the appropriate grid managers and departments. In special industries, such as public security and transportation, dedicated grids can be divided to locate problems and events using coordinates.

- **‘Grid+’ Urban Management Platform Unifies Information Portals to Collect and Share All Data, Improving Government Services**

‘Grid+’ urban management and services is supported by a physical supervision center that collects information from multiple channels, including grid administrators, city hotlines, SMS, websites, and

WeChat official accounts. The center serves as a unified information portal to collect and analyze urban issues, with the information compiled into an issues list. Later, management and service lists can be generated based on the nature of the issue and the department’s core functions, and issues can be assigned to respective departments for handling.

Using online resources, such as the ‘Grid + WeChat/app,’ the government is able to take part in more meaningful interactions with the public. An information channel is formed, which relies on public reporting and is supplemented by reports from grid administrators. The benefits of this approach are manifold: it unifies compliant channels, clarifies department functions, and prevents the shirking of responsibility.

### **Huawei Horizon Digital Platform: Creating a More Intelligent ‘Grid+’ Urban Management Platform**

On Huawei Horizon Digital Platform, the Real-Time Open Multi-Cloud Agile (ROMA) platform supports industry enablement. It provides one-stop integration services for various grid applications, including messaging apps, Application Programming Interfaces (APIs), and data integration, simplifying the architecture for application integration. ROMA interconnects with databases, middleware, and public cloud services, and supports conversion between multiple protocols, such as APIs, messaging apps, and databases. The configuration-based design reduces the workload for integrated development and lowers skill requirements for implementation personnel. Moreover, reliable APIs and cross-region message integration relieves issues that complicate the underlying network.

Huawei Horizon Digital Platform’s integrated communications capabilities enable the ‘Grid+’ urban management platform to



***The urban grid management platform, developed by Telchina and Huawei, has already been deployed in regions such as Lanzhou New Area and Gaoqing in Shandong Province. As well as creating value for customers, the platform also improves the competitiveness of Telchina's smart products and solutions. >>***

receive incident reports using multiple channels. In addition to hotlines, the platform supports reporting using voice, SMS, fax, VoLTE, apps, IoT, and video surveillance systems, offering a unified incident portal. The platform analyzes incident reports to classify and prioritize incidents. Priority is given to major disasters and incidents at important organizations, improving a government's emergency response capabilities. The platform also supports unified routing: even when different channels are used, the user's requests will be routed to the same agent who is able to process the user's audio, video, and multimedia messages simultaneously. Additionally, VoLTE video calls can be made on phones, making it easier to report incidents, while also being more cost-effective, with assured call quality.

Huawei Horizon Digital Platform's IoT and video capabilities enable automatic case detection, and intelligent case registration and distribution on the 'Grid+' urban management platform. This means that IoT devices — smart manhole covers, street lights, and video surveillance systems — can be used to identify potential risks in the city. Urban management incidents, after being found, are automatically reported to the supervision and command center, which then verifies and registers the case, and delegates the case to the related service department. This reduces labor costs and complaints, and improves resident satisfaction. Intelligent case registration and distribution also improve case processing efficiency, while helping governments improve their reputation.

Huawei Horizon Digital Platform's Integrated Communications Platform (ICP) is used to construct the industry's first integrated command center that supports full-process visualization. It features a Computer-Assisted Dispatch (CAD) system as its core, while it integrates voice, video, and data

communications modes, and visualizes information on the unified Geographic Information System (GIS) platform. The ICP enables unified scheduling of resources and improves inter-department collaboration capabilities by working with grid applications. City decision-makers and experts can join a consultation conference either from mobile terminals or on an HD videoconferencing endpoint anywhere, anytime, to provide directions and guidance to on-site police officers in real time. The center also displays the statuses of emergency resources, such as people, vehicles, and objects, on maps in real time, and it enables real-time synchronized information sharing for cross-agency collaboration in an emergency.

Huawei Horizon Digital Platform integrates core capabilities, such as AI and Enterprise Intelligence (EI), to intelligently analyze video and structured data, providing intelligent case analysis and analysis support for grid applications. The video AI automatically identifies incidents such as road blockages, and sends related information — geographical location and image evidence — to urban management departments, while simultaneously reporting cases to the grid management platform. Then, cases are registered and processed accordingly. Cases that are verified are automatically assigned to the related department for handling, in turn accelerating case processing. In addition, grid applications feed data to the grid management platform, which is then visualized, presenting the data in a more comprehensive way.

The urban grid management platform, developed by Telchina and Huawei, has already been deployed in regions such as Lanzhou New Area and Gaoqing in Shandong Province. As well as creating value for customers, the platform also improves the competitiveness of Telchina's smart products and solutions. ▲



# Yanbu Industrial City: A Smart City Emerges in the Oil Kingdom

In recent years, falling global oil prices have created challenging opportunities for Saudi Arabia to move toward renewable energy and open new investment projects that will support the economy, since oil generates about 70 percent of the country's revenue. As such, Saudi Arabia announced its new transformation program called 'Vision 2030' in April 2016. This ambitious yet achievable blueprint has clarified the goals of developing cities, achieving environmental sustainability, improving digital infrastructures, and expanding the variety of digital services. In particular, this new initiative recognizes the significance of expanding industrial clusters and attracting more high value-added investments — as feasible ways to build up national competitiveness. In line with Saudi Arabia's vision, the Smart Yanbu Industrial City project has started to build upon the hopes of Saudi Arabian citizens for transformation.

## Smart Yanbu Industrial City, a Transformative Engine for the Oil Kingdom

In 1975, Yanbu Industrial City was set up according to a royal decree and managed by a Royal Commission. After more than 40 years of fast growth, Yanbu industrial city has become the third largest oil refinery center in the world. It can produce more than 1.1 million barrels of oil every day, and its yearly industrial production capacity reaches 131 million tons. Yanbu has also set up the largest petroleum transportation port near the Red Sea and established key petroleum liquefying and processing locations.

Yanbu industrial city has become the beneficiary of high-speed industrialization. The efficient city layout, wide roads, sufficient public spaces, and green parks all indicate the vitality of this fast-growing city. However, Yanbu is also facing ever-increasing pressure. For example, limited network bandwidth cannot meet the requirements of governments, enterprises, and residents, affecting office efficiency and online entertainment experiences. The daily operations of large refining factories, ports, and warehouses, as well

as large-scale city construction require a large number of heavy vehicles. Overloading and speeding by these heavy vehicles have resulted in costly maintenance for the roads. Public parking spaces are difficult to manage because there are too many private cars. Road lighting costs are high. Building rubble and waste are sometimes not handled in a timely manner. Security risks exist in densely populated areas. A large number of underground industrial facilities need security due to lack of monitoring.

In line with 'Vision 2030,' the Royal Commission for Yanbu (RCY) decided to take the lead in addressing the Yanbu industrial city challenges by constructing the Smart Yanbu Industrial City.

Dr. Alaa Nassif, Chief Executive Officer (CEO) of RCY, said, "Today's global competition is fierce. We hope to maintain the competitiveness of the city through our Smart City initiative. We have focused on industrial growth over the past 40 years. Now, we will gradually shift to more diversified sectors including entertainment, tourism, and science and technology. In doing so, we desire to create industrial clusters, enhance collaboration between

**In line with 'Vision 2030,' the Royal Commission for Yanbu decided to construct the Smart Yanbu Industrial City, to create industrial clusters and expand business diversification.**

industries, expand business diversification, improve investment environments, and enhance competitiveness.

“The vision of building a Smart Yanbu Industrial City is aligned with the ‘Vision 2030’ goal. It aims to improve the quality of life through a Smart City. We have set a series of specific goals. For example, all national transformation projects that have been planned will be on the right track; the annual Smart City revenue will exceed US\$66 million; average incident response time will be less than seven minutes; the annual traffic accidents will be fewer than 1,200; the optical fiber coverage rate will be greater than 59 percent; the free Wi-Fi coverage rate in public places will be higher than 70 percent; the public lighting costs will be reduced by 30 percent; the waste clearing efficiency will grow by 30 percent; and the road maintenance costs will be reduced by 20 percent.”

The Smart Yanbu Industrial City plan has three phases:

- **Phase 1 (Smart City 1.0):** Focuses on the construction of city infrastructure, such as city broadband and cloud computing, to build a connected city
- **Phase 2 (Smart City 2.0):** Revolves around city applications, including security, intelligent public services, and environmental protection, to build a sensor-enabled city
- **Phase 3 (Smart City 3.0):** Centers on the city platform, covering the city management platform and smart community portal, to ultimately build a fully intelligent city

### **The Smart City Initiative Pays Off After Two Rounds of Construction**

It is impossible to conceive of Smart Cities without strong information infrastructures. For Phase 1 of the project, city broadband was the core, and RCY implemented Public-Private Partnerships (PPP). Specifically, RCY provided public infrastructure such as roads, buildings, power grids, water services, and city optical networks, while the telecom

operator Mobily delivered telecom infrastructure and Huawei provided Information and Communications Technology (ICT) solutions, including Smart City data centers, GSM/3G/LTE, as well as related service and operations support systems.

This PPP mode gave full play to complementary advantages and ensured mutual benefits. As a result, the wired and wireless broadband networks across the entire city were quickly constructed, providing high-speed network access services, and delivering improved network experiences for governments, industry, and residential areas. In addition, open access networks were deployed to connect the transportation signal facilities to prepare for the construction of the next phase of the Smart City.

In 2016, for Phase 2 of the project, smart applications were launched. Aiming to enhance municipal administration, RCY focused on eight smart applications, including Heavy Vehicle Management, Smart Waste Management, Smart Streetlight, Smart Parking, Smart Energy Efficiency Monitoring, Crowd Density Analysis, Smart Manhole Cover, and Comprehensive Performance Assessment. These applications improve municipal administration efficiency, enhance public safety, and create a better living environment. Huawei provided a comprehensive portfolio of network and Information Technology (IT) solutions (including wireless access points, routers, switches, servers, storage, and 2G/3G/4G base stations), devices such as surveillance cameras, the eSight + Network Management System (NMS) platform that uniformly manages network-wide devices, and software products provided by Huawei partners. All these help ensure that the data collected by front-end devices can be transmitted to the back-end system in a secure, stable, and real-time manner for management and analysis.

- **Heavy Vehicle Management:** Almost all industrial cities have these major problems: Overloading and speeding of vehicles, which make the road susceptible to damage and expensive to maintain. To prevent this, Yanbu has buried pressure and length sensors in important

## Yanbu Industrial City: Enjoying Benefits of Smart City Construction

- The road maintenance cost has been reduced by **20** percent.
- The garbage clearing efficiency has been improved by **50** percent.
- The overall cost of the public lighting system has been reduced by **30** percent.
- The utilization of public parking spaces increased by **30** percent.

entrances and exits of industrial areas. These sensors work with HD License Plate Recognition (LPR) cameras that are set up at the roadside to accurately record information about all vehicles passing by, such as the registration information, speed, and weight. Through the networks, routers, and switches, such information will be uploaded to the automatic management system that can assess penalties to vehicles for overloading and speeding. High efficiency of road transportation is crucial to a country that is undergoing transformation. The new dynamic weighing system does not require vehicle docking or manual guidance; therefore, traffic is not affected. The dynamic weighing system also does not require fixed weighing sites or employees for on-site work, reducing construction and operations costs by 80 percent.

- **Smart Waste Management:** In Saudi Arabia, the hot weather accelerates garbage deterioration. However, almost all garbage bins are uncovered, have an unpleasant smell, and attract stray cats, dogs, and mice, which increases the risk of infection and disease. The Smart Waste Management Solution provides capacity sensors powered by solar energy. With such capacity sensors installed, the fill-level of a garbage bin is reported in real time, so that the administrator can optimize the driving routes of garbage vehicles to improve garbage collection efficiency. In addition, the oil consumption of garbage vehicles is monitored. The administrator is notified of all exceptional changes in the oil volume to prevent oil theft.

- **Smart Streetlight:** The old streetlight system had limited management and control over streetlights. The system could simply turn on and off streetlights, and only notify the related management department of streetlight faults. Now, the energy-consuming and high-voltage sodium lamps that could not be remotely controlled

have been replaced with new LED lighting modules, which feature low energy consumption, can be automatically turned on/off, and can have brightness adjusted according to the environmental conditions. The use of such modules reduces the lighting energy consumption by 70 percent. With the Smart Streetlight system, the lighting policy can be flexibly configured and modified on a per-streetlight basis, instead of the traditional power-on and power-off based on the power phase line. The management platform provides information about the working status and service life of every streetlight, which reduces the workload of traditional road device inspection. In addition, by integrating terminals such as digital signage, environment monitoring sensors, emergency alarming devices, speakers, and surveillance cameras, the streetlights can provide diverse information (such as emergency notifications and weather updates) and provide convenient services (such as emergency calls and video surveillance), building a better interactive platform for bridging the government and citizens.

- **Smart Parking:** The parking lots in Yanbu have long been free of charge for citizens, which objectively leads to unfair allocation of parking resources in popular places. While keeping most parking lots free of charge, the smart parking management system charges the residents who use the parking lots in popular places. This effective combination of technologies and economics ensures that resources are provided based on citizens' needs. The usage of a parking space is reported in real time by the geomagnetic and infrared sensor installed on the parking space. The number of available parking spaces and the occupancy duration of each parking space are automatically and quickly determined. Citizens can pay parking fees in various ways, such as using smartphones and parking fee machines.

- **Smart Energy Efficiency Monitoring:** The high incomes in Saudi Arabia allow residents to enjoy cheap electricity services, which inevitably increases resource consumption and creates a burden to the vulnerable ecosystem. RCY has decided to reduce power consumption in office areas and set a good example to encourage residents to enhance their awareness of power conservation. The energy consumption sensors in office buildings can collect power consumption data on each area in real time. Then, diverse management approaches based on power consumption data comparisons can be taken to improve government staff's awareness

of energy savings and promote reasonable power consumption. The sensors can also remotely control the power supply. During non-working hours, the sensors can be remotely controlled to shut down air conditioners and lighting devices for more energy savings.

- **Crowd Density Analysis:** With the popularity of smartphones, Wi-Fi is now everywhere. Consequently, monitoring Wi-Fi signals can accurately learn the distribution and flows of people, allowing city authorities to closely follow situations and take necessary measures in a timely manner in the case of any emergencies.

- **Smart Manhole Cover:** As an industrial city experiencing rapid growth, Yanbu has a large number of pipes, valves, and connectors installed underground. The manhole covers for accessing these facilities have become a focus for security measures to protect the underground facilities from becoming targets for attacks. The Smart Manhole Cover Solution provides remote control over manhole covers. The covers can be opened only when maintenance is required, preventing unauthorized access. Different types of sensors such as hazardous gas detection and water permeation detection sensors can be installed on the covers for different types of manholes, monitoring overflow accidents in real time and ensuring the safety of personnel inside.

- **Comprehensive Performance Assessment:** With this comprehensive assessment system, the key tasks of all related city departments can be planned and assigned in a unified manner, and the progress of each department's work indicators is monitored. This helps identify problems ahead of time and find the root causes. The unified performance indicators help promote collaboration between departments and hence improve government work efficiency.

### Livable and Business-Friendly City with Higher Attractiveness

After two phases of Smart City construction, Yanbu Industrial City is starting to enjoy many benefits. The road maintenance cost has been reduced by 20 percent; the garbage clearing efficiency has been improved by 50 percent; the overall cost of the public lighting system has been reduced by 30 percent; and the utilization of public parking spaces increased by 30 percent. In the third phase of Smart City construction, a Big Data analytics platform, Internet of Things data platform, and communications integration platform will be built to support municipal

services, investment trend analysis, smart public facilities, emergency response and smart police services, and build an integrated command center. RCY will continue to deepen its collaboration with Huawei and leverage new technologies to enable residents to enjoy better public services and make Yanbu more attractive.

Dr. Nassif said, "The Smart City project has proven that our Royal Commission is visionary. We are on the right track and all will benefit from the Smart City project, including the government, enterprises, and individuals. Smart City construction not only greatly improves Yanbu's public service level, but also enhances its capability of attracting high value-added investments. Since the construction of Smart Yanbu Industrial City in 2014, the growth rate of external investments has reached 16 percent, much higher than the previous 2.5 percent; by June 30, 2017, RCY has 81 companies of Light/Support industry in operation, 36 under construction, and 33 in design; restaurants account for 16.7 percent of commercial establishments in operation, retail shops occupy 12.42 percent, and business offices take up 14.9 percent; the satisfaction rate of residents has reached 90 percent; and the revenue from the Smart City construction is continuously increasing and is expected to reach US\$100 million in the next year.

"With deeper development of the Smart City project, more and more young people choose to work and start a new life in Yanbu. Both the employment rate and the population are increasing in a healthy and orderly manner." ▲

### Customer Testimony

"The cooperation and achievements of the RCY and Huawei for Smart Yanbu Industrial City establishes a good model for other cities. Huawei leads a robust ecosystem. Through flexible application of new ICT innovations, we can now sense, analyze, and integrate more city operations, enrich key information required by the management system, and make smarter, faster responses to various requirements, such as city governance, public services, and business activities. I believe that such a data-driven city development path can inject new energy into improving people's lives, optimizing city operations and management, and enhancing business with other cities around the world. It will definitely create a better city life for human beings."

— Dr. Alaa Nassif, Chief Executive Officer of RCY

# Huawei Helps the City of Ekurhuleni Grow into a South African Smart City Pioneer

The City of Ekurhuleni (COE) is an important industrial center in Gauteng, which is South Africa's most economically developed province. With an area of 1,975 km<sup>2</sup> and, according to Stats SA (the national statistical service of South Africa) a 2016 population of 3.37 million people, Ekurhuleni is the country's fourth-largest metropolitan area, behind Cape Town, Johannesburg, and eThekweni. Ekurhuleni is a modern, highly urbanized city, which has served to usher in advanced medical facilities and high levels of education. To achieve and maintain this concentration of technological advancement, COE needed to further transform its health, education, transportation, and security sectors, as well as upgrade basic services such as electricity, water, public health, and emergency medical care.

"Ekurhuleni is a vibrant and innovative city in South Africa," said Tumelo Kganane, Chief Information Officer for the city. "It is one of the largest air transportation, rail, and data hubs in South Africa. We have unique advantages in terms of technology, talent, and economy so we can build a Smart City, improve public satisfaction, and help enterprises grow. Smart City construction is a comprehensive project. We need to select the best partner to achieve success."

Huawei Horizon Digital Platform supports cloud data center solutions and converged communications solutions. Few other industry vendors can match the capabilities and products offered by Huawei. Huawei solutions are also compatible with third party developers that help customers participate in the prosperous global market of Smart City ecosystems. To date, Huawei Horizon Digital Platform has been deployed in more than 200 cities across over 40 countries. In view of these advantages, Ekurhuleni selected Huawei to help it become a Smart City.

## Everything Began with Connectivity

After studying the complexities at play in Ekurhuleni, Huawei helped the city design customized Smart City strategies, covering 'connected city,' 'efficient city,' and 'smart city.' Ekurhuleni planned to build a safe, green, clean, healthy, and intelligent city based on an understanding of the 30 elements that constitute a municipality.

At the same time, 11 IT strategies were developed:

- Deliver business solutions
- Optimize IT management and governance
- Improve IT organization and employee capabilities

- Reduce IT costs
- Integrate IT operation and resources
- Expand the scope of informatisation and data analysis
- Deploy mobile solutions
- Simplify business processes
- Integrate main businesses
- Improve the relationship between business departments
- Facilitate infrastructure development or management

In terms of strategy implementation, everything began with connectivity.

First, the City of Ekurhuleni built fiber broadband infrastructure to provide broadband access for third parties and enable data center network access to boost the economic development of local enterprises. The customer deployed a 1,400 km fiber network infrastructure that reduced production costs by 75 percent.

Second, Huawei enabled wireless broadband connectivity to provide free, public Wi-Fi. Government office buildings, municipal clinics, and libraries were the first to be covered, and were soon followed with the addition of commercial and residential areas.

Third, Huawei deployed a video conferencing solution to support Ekurhuleni's 27 departments and public utilities, including access to remote branch offices. In the past, when city staff would travel through heavy traffic for frequent inter- and intra-departmental meetings, the journey to the meeting could last longer than the meeting itself. Today, with a new videoconferencing system deployed in all important buildings, efficient communications among government departments and public utilities is assured. The high quality, easy-



Through cooperation with Huawei, Ekurhuleni has deployed city-wide wired and wireless networks, powerful cloud data centers, and government applications. These are the cornerstones of a Smart City.

to-use videoconferencing solution has improved office efficiency by saving time and reducing costs. In addition, the videoconferencing solution integrates with office systems and business systems to better support the city's customer service business.

### Cloud-Based Data Center

Historically, government departments have been slow to resolve problems that affected citizens and local enterprises. Coordination between departments has been irregular and often difficult because department data has been isolated in separate data centers. Ekurhuleni chose to build a secure, stable, and open cloud data center that could integrate diverse government applications, thereby improving government efficiency.

With more than 30 core applications and database business systems in operation, COE required the following:

- Zero data loss due to municipal system failures.
- Automatic fault detection and switchover for virtual machine and database services.
- Low capital investment, and quick system and service rollout.

Through comprehensive innovation in chips, hardware, and software, Huawei is able to provide customers with the most complete cloud data center solutions in the industry. The Ekurhuleni solution is an end-to-end active-active data center with business migration, continuity, and disaster recovery resources that are based on server, storage, and switching products. The solution achieved the following:

- Enabled intra-city active-active capability for core systems and remote application-level Disaster Recovery (DR) for applications to ensure zero data loss and service downtime.
- Improved the virtualization rate to 90 percent to boost operational efficiency and reduce power consumption.
- Provided automatic switchover and visualized DR to reduce

Operations and Maintenance (O&M) costs and improve management efficiency by 65 percent.

The upgraded data centers ensured stable operation of Ekurhuleni's diverse smart government applications. One of those applications is the 'My Ekurhuleni' app to provide mobile access to a majority of local government services.

"Through cooperation with Huawei, Ekurhuleni has deployed city-wide wired and wireless networks, powerful cloud data centers, and government applications. These are the cornerstones of a Smart City," said Kganane. "We plan to build other IoT applications, such as Smart Transportation, Smart Buildings, Smart Meter Reading, and Smart Education. We will also build a command and control system based on unified communications to further improve city operation efficiency. We are determined to be a Smart City pioneer in South Africa by staying focused on good governance, people's welfare, and economic revitalization." ▲

### Ekurhuleni: Growing into a South African, Smart City Pioneer

- Designing **3** Smart City strategies and **11** IT strategies based on **30** elements that constitute a municipality.
- Deploying a **1,400** km fiber network infrastructure that has reduced production costs by **75** percent.
- Deploying a videoconferencing solution to support Ekurhuleni's **27** departments and public utilities.
- Improving the virtualization rate to **90** percent to boost operational efficiency and reduce power consumption.



# Spain's Rivas-Vaciamadrid Enhances Smart City 'Nervous System' Functions with Huawei eLTE Broadband Solution

In front of the Jose Saramago school gate in the city of Rivas-Vaciamadrid, Spain, a father who was unable to find his child was anxiously seeking help from a police officer patrolling near the school. The police officer immediately called the Command Center for support and used his handheld eLTE terminal to photograph pictures of the child that were stored in the father's cellphone; he then transmitted the photos to the Command Center.

Upon receiving this incident report, the Command Center for the Rivas-Vaciamadrid Police Station took immediate action to address the situation. They quickly pinpointed the nearest patrol vehicles through their command system, dispatched them to the field for support, and sent the photos of the child and missing-child notification to the handheld eLTE terminals of all the police officers in that region. Meanwhile, the Command Center searched for any traces of the child by isolating the real-time video feeds from the surrounding cameras. Less than a half hour later, a police officer found a likely match at a nearby basketball court and immediately used his handheld eLTE terminal to start a video call with the father. Once confirmed that this was the missing child, the father and son were reunited.

Every year, there are many children worldwide who temporarily go missing. In the US alone, about 800,000 children go missing

annually. The first 24 hours is the critical period for finding missing children. Police officers in Rivas-Vaciamadrid could not have found the missing child or handle similar cases so quickly if they used a Terrestrial Trunked Radio (TETRA) narrowband network. So, how did they make this possible?

## The City's 'Nervous System' Urgently Receives Smart Upgrades

Rivas-Vaciamadrid is a city belonging to the autonomous community of Madrid, Spain. The city covers a land area of 67.4 square kilometers, with a population of about 84,000, and is located just 15 kilometers away from the center of Madrid. This city is one of the youngest in the Madrid region, with an average age of 34. It is also one of the region's most environmentally friendly and sustainable cities. In 2014, Rivas-Vaciamadrid won the European Union's

**The new eLTE network developed by Huawei and Rivas-Vaciamadrid City Council provides voice, video, and information services for the city's security and emergency response. Huawei's eLTE network solution is well integrated with all the systems in the city, especially with the Rivas-Vaciamadrid Smart City project.**

#### *Sustainable Urban Mobility Planning (SUMP) Award.*

Rivas-Vaciamadrid is a founding member of the Spanish Network of Smart Cities (RECI) and is widely recognized as a pioneering 'Smart City' in Spain. Currently, Rivas-Vaciamadrid has a network of 800 kilometers of fiber-optic cables that interconnects 86 municipal buildings, and provides public Wi-Fi services for the entire locality.

Pedro del Cura Sanchez, Mayor of Rivas-Vaciamadrid, said: "In 2004, the city decided to start investing in technology. There were two important factors to determine this investment. The first factor was to create a better-managed city with enough technology resources for more efficient city management and greater savings. The second factor was to better serve citizens with these technology resources."

The objectives of Rivas-Vaciamadrid coincide with Huawei's three goals when working with customers to build Smart Cities: smarter city administration, more benefits for citizens, and economic revitalization.

A Smart City is like a living organism, which is powered by a nervous system. A Smart City 'nervous system' consists of a 'brain' (the control center) and 'peripheral nerves' (the network and sensors). This system gathers real-time information about the status of the city, transmits the data, enables the 'brain' to analyze and make informed decisions, delivers feedback commands, and ultimately carries out intelligent actions.

The legacy 'nervous system' of the Rivas-Vaciamadrid government was a TETRA network they had built in 2005. This legacy network had the following problems:

- The TETRA narrowband provided voice services only and did not support multimedia data applications, such as a real-time Geographic Information System (GIS) and mobile surveillance. As a result, this

network failed to meet the requirements of government and police agencies for video and large-traffic data usage. For example, the police asked that visibility capabilities be added to better learn about on-site situations through video within short periods of time. However, this network did not support such functions, resulting in limited awareness of on-site situations and a low policing efficiency.

- The incident receiving and handling systems were not integrated with each other. In other words, the command and dispatch system was isolated from the video surveillance system. This isolation slowed down emergency response times and created difficulties in cross-department collaboration.

- The legacy network had been running for more than 10 years and was approaching the end of its lifecycle. The resulting maintenance costs were high.

- Due to the shrinking narrowband industry chain, narrowband network operators failed to find the right evolution direction even though they wanted to upgrade.

Because of these problems, the Rivas-Vaciamadrid government urgently needed to upgrade its existing network and decided to build new Smart City 'nervous system' functions that could cover the entire city, and provide more efficient command and dispatch services for 330 police officers.

#### **Improved On-Site Visibility, More Efficient Commanding**

Huawei is one of a few vendors in the industry that provides a complete set of ICT solutions characterized by 'cloud-pipe-device' synergy. Huawei's eLTE Broadband Trunking Solution provides a comprehensive platform that includes video backhaul, broadband



***Huawei's eLTE Broadband Trunking Solution dramatically improves the command and dispatch efficiency as well as quick response capabilities for Rivas-Vaciamadrid police officers in all cases, regardless of major activities, emergency handling, and daily police operations.***



trunking, and critical communications on a single network to enable visualized dispatching. This solution is mainly intended for the public safety sector and extends to Smart Cities with integrated access network platforms to other sectors, establishing a solid foundation for more Smart City applications.

After a careful review of multiple factors, the Rivas-Vaciamadrid government selected Huawei's eLTE Broadband Trunking Solution to upgrade its legacy network.

The Huawei eLTE Broadband Trunking Solution has the following key features:

- The solution uses the most advanced LTE wireless broadband technology to enable 100 Mbit/s for downlink transmission and 50 Mbit/s for uplink transmission.
- A single network supports multimedia trunking, video dispatching, HD wireless video surveillance, real-time distribution and backhaul of HD videos and pictures, ultra-long-distance data acquisition, and mobile office services.
- The Command Center can review videos sent back in real time from eLTE terminals or directly

watch the live video images captured by city-wide surveillance cameras. By doing so, the Command Center can accurately assess on-site conditions and effectively manage on-site incidents remotely. Additionally, by using GIS to locate people and vehicles, the Command Center can designate the most appropriate police resources and achieve visualized dispatching.

- The handheld eLTE terminals can be installed with the police station's intranet office software, covering email, video surveillance, and police dispatching. These installations implement better-connected mobile police operations and provide enriched police dispatch information through multimedia police dispatching tickets. In the case of emergencies, nearby police officers can collaborate with each other in real time. In this way, police dispatching and incident handling are more accurate and efficient.
- The eLTE broadband trunking system can interwork with the legacy TETRA system and communicate with public-network cellphones. High compatibility achieves the convergence of multiple network communication methods and more efficient cross-department communication and collaboration.
- The eLTE broadband trunking network can be interconnected with the public network to implement public network coverage in areas with insufficient private network coverage. This interconnection expands the scope of applications and reduces the initial investment. In this way, investments can be gradually increased to improve coverage and data capabilities.

To address spectrum problems, Huawei collaborates with Masmovil, the fourth-largest mobile carrier in Spain, to provide a 2.6 GHz frequency band; Huawei is collaborating with the live-network integrator Tecnicas Competitivas to provide eLTE broadband trunking and maintenance services; and Huawei is working with the wireless

### ***Spain's Rivas-Vaciamadrid: Enhancing Smart City 'Nervous System'***

- A fiber-optic network of **800** kilometers interconnects **86** municipal buildings, and provides public Wi-Fi services for the entire locality.
- New Smart City 'nervous system' functions provide more efficient commanding and dispatch services for **330** police officers.
- **80** percent of the area benefits from the eLTE network coverage. All city management systems are deeply converged.
- Upgrading the existing network, enabling **100** Mbit/s for downlink transmission and **50** Mbit/s for uplink transmission.

planning consulting firm Aptica to provide network planning, technical consultation, and recommendations for the project.

Huawei's eLTE Broadband Trunking Solution dramatically improves the command and dispatch efficiency as well as quick response capabilities for Rivas-Vaciamadrid police officers in all cases, regardless of whether they are major activities, emergency events, or daily police operations.

Fernando Argote Cardenosa, the director of the Rivas-Vaciamadrid police station, said: "The Command Center provides advantages that are clearly beneficial to Rivas-Vaciamadrid citizens. From here, we control the city traffic. For many public safety incidents, such as missing children, we find that the Huawei eLTE Broadband Trunking Solution is crucial. The most important thing for public safety is the ability of the Command Center to respond quickly."

### Smart City Services Reach New Levels

Currently, 80 percent of the Rivas-Vaciamadrid area benefits from the eLTE network coverage. What makes the Rivas-Vaciamadrid city stand out from other cities is that all city management systems are deeply converged. Almost all city facilities that can be remotely managed are networked — including video surveillance, energy management, public lighting, decorative fountains, street-side public facilities, and park irrigation facilities. The local government also provides location-based services, so that any manager can access city management applications anytime, anywhere, and from any device through Wi-Fi access via Bidi, RFID, and NFC.

Carlos Ventura, Director of the Rivas-Vaciamadrid Telecommunications Department, said: "The evolution from narrowband to broadband is an inevitable trend. Huawei's eLTE network solution is well integrated with all the systems in the city, especially with the Rivas-Vaciamadrid Smart City project. From an eLTE terminal, you can access any system in the city, such as public lighting. In the event of an emergency, police officers and other city managers may increase lighting and perform any other actions, such as opening doors or buildings via the eLTE terminal without the need for keys or other assistance."

Ana Reboiro, a member of the Economic Development and Employment Council and Interior System and Telecommunications

Council, said: "The new eLTE network developed by Huawei and our Rivas-Vaciamadrid City Council provides voice, video, and information services for all of the city's security and emergency response needs. This new network is the foundation for addressing new challenges in urban development and will improve the daily lives of Rivas-Vaciamadrid citizens. This is the first-of-its-kind project in Spain. Once again, Rivas-Vaciamadrid leads the development of new technologies for city services. I would like to thank Huawei for the trust that they have placed in the Rivas-Vaciamadrid City Council. I hope that we can continue to work together on developing new technologies to respond to new challenges in the future."

By applying a series of new ICT technologies, such as cloud computing, Internet of Things (IoT), and Artificial Intelligence (AI), Huawei is dedicated to expanding 'nervous system' functionalities that empower Smart Cities. With innovation and accrued experiences in various technologies, Huawei has developed an open platform for Smart Cities. This platform is compatible with various devices in the downstream direction and supports a wide range of applications in the upstream direction. In the future, Huawei will continue to work together with ecosystem partners to help Rivas-Vaciamadrid add visibility to daily city operations, accelerate cross-departmental emergency response and big data-based city management decision-making, and further enhance the operations of public services such as education, energy, and public safety. These improvements will create a solid foundation for the ongoing Smart City journey of Rivas-Vaciamadrid. ▲

### Customer Testimony

"This is the first-of-its-kind project in Spain. Once again, Rivas-Vaciamadrid leads the development of new technologies for city services. I would like to thank Huawei for the trust that they have placed in the Rivas-Vaciamadrid City Council. I hope that we can continue to work together on developing new technologies to respond to new challenges in the future."

— Ana Reboiro,

a member of the Economic Development and Employment Council and Interior System and Telecommunications Council



# LNA: Building a Smart National New Area with Science, Technology, and Intelligence

By *Liu Haoming, Member of the LNA Work Committee of the Communist Party of China and Deputy Director of the Management Committee*

**A**s northwestern China's first national New Area, the Lanzhou New Area (LNA) plays a critical role in the region's development: It is positioned as an important economic growth pole, a national industrial base, and a strategic platform to facilitate opening up in western China; it also serves as a demonstration area for industrial relocations. Based on President Xi Jinping's major speeches on national big data strategy and digital China, the LNA is perfectly aligned with the country's strategic position, as it "promotes innovations with science and technology, and seeks development with intelligence." With the principle of "good governance that benefits the people and promotes industries" at its core, a new Smart City is being built at the LNA.

Close cooperation between the LNA and Huawei began in 2017. Together they planned and formulated top-level design schemes for the Smart City, with 22 projects covering ICT infrastructure platforms, city governance, public services, industry development, and Smart City operations. These projects facilitate the building of a digital economy centered around the Smart City, and replace traditional development drivers with new ones, boosting the area's development.

Huawei Horizon Digital Platform lays a solid foundation for the area's intelligent development. With Huawei Horizon Digital Platform, the LNA can take advantage of a multitude of advanced capabilities, such as cloud computing, big data, Internet of Things (IoT), Geographic Information System (GIS), video convergence, and

communications integration. Based on these capabilities, the platform uniformly carries information systems of over 40 departments, connects to eGovernment extranets of more than 30 departments, and covers 45 eLTE wireless base stations across the city.

Nine service projects have been launched in the first phase: the Smart City operation center (the city's brain), government big data sharing and exchange platform, spatio-temporal information service platform, IoT platform, eLTE municipal wireless private network, eGovernment extranet, government collaborative office platform, government service linkage approval system, and smart healthcare. Second phase projects — such as the emergency command linkage system, grid city management platform, and video cloud — are now under construction.

The LNA is developing its big data industry, promoting innovations with science and technology, and seeking development with intelligence. Following Smart City principles, the government is using intelligence to empower the city's comprehensive management, public services, and economic development, to realize its goals of becoming a Smart City, a 'Silk Road Information Port City,' and an 'Intelligent Manufacturing Base.'

### Smart City Empowers Area Development with All-Round Intelligence

The benefits of the new Smart City are evident: bringing better governance and quality of life to residents as well as optimizing the use of urban resources. The goals to use scientific decision-making, provide efficient public services, and practice optimal

social governance have been achieved, with all-round intelligence empowering the area's development.

#### • Smart Brain Enables Visualized City Governance and Intelligent Decision-Making

The Smart City's Intelligent Operation Center (IOC) is built on the principles of "unified planning, centralized sharing, and

## The Lanzhou New Area — a Smart National New Area

- *Smart Brain (Smart City IOC): Performing data analysis and intelligent modeling for key operational indexes, enabling event management and emergency command, and improving emergency-handling efficiency by **50** percent.*
- *Smart Government: Processing **594** administrative approval items under the "One Number, One Window, One Network" principle to improve service efficiency by **100** percent.*
- *Grid-Based Governance: Building a "grid-based governance map," constructing a total of **770** grids, providing **114** categories of major and minor events and IoT components.*
- *Unified Platform: Building China's first city-level government networks, improving the network resource intensification by **8** times and delivering excellent value for money.*
- *Smart Healthcare: Three healthcare institutes and **61** healthcare service center systems were developed based on smart healthcare, serving about **70** percent of the population in the area.*
- *Industry Upgrade: A **3.33**-square-kilometer cloud computing industrial park and **1**-square-kilometer Silk Road information port was constructed in the LNA's core area. Thirty-five big data projects were signed with a total investment of CNY **35.3** billion (about US\$**5** billion).*

coordinated services,” creating a unified system architecture with unified standards, specifications, construction and Operations and Maintenance (O&M). The construction period lasted for more than a year, and it covers three decision-making analyses (economic, industrial and urban public safety analysis), and two applications (emergency command linkage and grid-based management) that concern seven situational topics, such as people’s livelihoods, the economy, city governance, and urban safety.

The Smart City IOC, powered by Huawei Horizon Digital Platform’s Artificial Intelligence (AI) and big data architecture, aggregates the area’s panoramic data, and can perform data analysis and intelligent modeling for key operational indexes. It also features city situational awareness, operation management, monitoring, and decision-making support. With visualization for city information, the IOC enables event management and emergency command, and the coordination of different departments for unified linkage and command, improving emergency-handling efficiency by 50 percent.

- **Smart Government Improves Administrative Service Efficiency**

The LNA is promoting administrative services that are “commitment-based, free, informative, and agent-based” to shorten the project approval and implementation time from 60 to 10 working days, and process 594 administrative approval items under the “One Number, One Window, One Network” principle to improve service efficiency by 100 percent. Newly established community service centers and 24-hour self-service kiosks make government services more readily available, improving service efficiency by 50 percent. A new electronic certificate database has also been established to integrate business license, organization code, tax registration, social insurance, and statistical registration — improving enterprise service efficiency by 100 percent. The LNA greatly improves comprehensive tax collection and management of national taxes and land taxes by enabling taxpayers to issue electronic invoices on cellphones, reducing costs for enterprises by 30 percent. Additionally, because tax services are simplified and more convenient, tax offices are less crowded and can operate with fewer disruptions.

The LNA also has an exceptional business environment. For example, its agent-based service provides enterprises with full-process services free of charge. The free service reduces early

project costs by 70 percent. The incremental power distribution reform reduces the electricity price for each household of big data enterprises to only CNY 0.28 per kilowatt hour (about US\$0.4/kWh), leading to electricity cost savings of more than 60 percent. The trial implementation of a flexible land transfer policy reduces land costs by offering more options, such as leasing and transfer before leasing. The LNA has also adopted a series of favorable and supportive policies, and has delivered financial incentives totaling CNY 4.2 billion (about US\$814 million). With all of these measures contributing to make the LNA business-friendly, it has attracted more than 600 enterprises to operate here since its inception.

- **Grid-Based Governance Refines City Governance**

A comprehensive city governance platform is built based on grids; it uses geographic information technologies to integrate various information from urban events and IoT components to build a “grid-based governance map.” The LNA has constructed a total of 770 grids, covering Zhongchuan Park, Qinchuan Park, and Xicha Park. Grids are divided into four levels: areas, streets, communities and grids — covering the entire LNA. The area provides clear and specific case standards for 114 categories of major and minor events and IoT components, including 13 major event categories, such as the urban environment, public safety, food and drug safety, and campus safety. Relevant departments are incorporated into the grid-based platform based on the event categories, to facilitate accurate and efficient communication and improve processing efficiency.

- **Smart Emergency Response Improves City Emergency Governance**

The newly built emergency command system enables the integration, optimization, and sharing of public safety data, and improves governance for emergency response. The command communications system integrates multiple networks to obtain a range of capabilities such as comprehensive communication convergence, full-process data aggregation, all-domain video perception, and all-dimensional presentation. Additionally, public safety awareness is heightened and intelligent emergency management is realized. Such an emergency management system enables unified command, the combination of ordinary and specialized systems, quick responses, upper and lower level linkages, and combined emergency prevention and emergency response operations. Disaster prevention, mitigation, and relief are

also improved, ensuring social stability, and providing greater safety for both lives and property in the area.

- **Unified Platform Unlocks Value**

China's first city-level government networks were built in the LNA, integrating wired optical communications, wireless command, and IoT sensor networks. Broadband and narrowband services are integrated, and 34 government extranet units and 45 eLTE wireless base stations are connected to create a centralized and unified government high-speed backbone network, covering the entire district. This network allows physical multiplexing of various fields and services, such as public safety, finance, energy, transportation, healthcare, and education. It ensures that network resource intensification (the integration of resources for improved efficiency) in the LNA is improved by eight times, effectively prevents network splitting and repeated construction, and delivers excellent value for money.

- **Smart Healthcare Balances Medical Resources**

Three healthcare institutes and 61 healthcare service center systems were developed based on smart healthcare, serving about 70 percent of the population in the area. In just two years, healthcare has gone through a monumental change: all-domain medical and healthcare information data sharing are realized, and health services — such as diagnosis, treatment, query, registration, complaint, and performance appraisal — can be done online. Residents of the area are offered unified E-Health cards and E-Health Records (EHR), which are used to share information between medical institutions. Physiological data sensors have been installed in more than 100 community medical institutions to implement comprehensive remote healthcare and assist with emergency medical rescue. The LNA is reinventing healthcare by delegating minor disease treatment and recovery to community practices and major disease treatment to hospitals.

- **Intelligence Enables Industry Upgrade**

A 3.33-square-kilometer cloud computing industrial park and 1-square-kilometer Silk Road information port was constructed in the LNA's core area. Thirty-five big data projects were signed, including HUAWEI CLOUD computing, Tsingchuang cloud computing, and State Grid cloud data center, with a total investment of CNY 35.3 billion (about US\$5 billion). By the end of 2019, 25,000 racks will be installed to provide services for 250,000 cloud computing terminals.



The LNA estimates that more than 100,000 racks will be installed by 2020, to provide high-quality, efficient, safe, and reliable big data services for 1 million cloud computing terminals in northwestern China as well as countries along the Belt and Road route.

### Setting a Smart City Benchmark for National New Areas

Seizing the major opportunities created by China's development and the proliferation of big data technology, the LNA drives innovation through science and technology and seeks intelligence-based development. Intelligence is at the center of the Smart City, empowering the city's comprehensive governance, public services, and economic development. Intelligence is also the key to transforming the city into a 'Silk Road Information Port City,' and an 'Intelligent Manufacturing Base.'

In the process of building a new Smart City, the LNA has proven to be a pioneer, with new highlights, features, and achievements being widely recognized and praised by the industry. The area has received multiple awards over the years — including: *2017 China Smart City Innovation Award*, *2018 China Smart City Innovation Award*, and *2018 Top 10 Recommended Smart City Visiting Destination Award* — and has debuted as an exemplar city at The Fourth China Smart City International Expo.

We are striving to make the LNA into a model city and elevate the standard for Smart City construction for other New Areas in China. ▲



# LETDA's 'Smart Brain' Unleashes Data's Potential

By *Chen Guangcheng, Chief Editor of the AI-Clubs*

**A**n Intelligent Operation Center (IOC) is key to the development of Smart Cities: it creates a new operation and governance model in terms of monitoring incidents and sounding the alarm, supporting decision-making, and handling events.

To satisfy this need, Langfang Economic and Technical Development Area (LETDA) and Huawei recently launched a joint IOC program (Phase I). This program is positioned as the 'Smart Brain' of the whole LETDA, deploying an urban index system to quantify the city's status. Using a rendering engine with 2D/3D integration, the IOC displays a panoramic view of the area, presenting a clear visual overview of the overall situation for city managers. Based on this kind of data, the government can better develop the economy while protecting the local environment, enhance city governance capabilities, and improve people's livelihoods and overall well-being.

## LETDA Activates Accumulated Data

An IOC has a key role in applying a city's big data, improving the efficiency of governance, and optimizing its development structure. The main objective of constructing the IOC in LETDA is to make best use of such data.

LETDA's unified construction of information systems — such as Wi-Fi, big data, smart government, and smart environmental protection — laid a foundation for service data. However, LETDA lacked a key platform to carry related services and provide unified information services externally. This is why the IOC became a priority for its Smart City development.

In the Smart City field, the term 'huge system' is often used. It indicates a large system that is composed of several sub-systems and involves complex interactions, collaborations, and interoperations between multiple departments or subsystems of the city. Data collection and processing is a basic task in Smart City construction.

The objective of such construction is to formulate a virtuous cycle by collecting data, promoting data analysis and application, and further improving data refinement.

LETDA encountered a series of challenges, including ineffective data analysis, application and display; severe information fragmentation; and the lack of data-driven intelligence support. Indeed, a large amount of data of government departments was accumulated with little flow or convergence. This meant that the data could not be used to detect city management and operations problems, or to present city governors with comprehensive and authentic data images; essentially, it was unable to provide effective analytical support for decision-making.

Given these problems, LETDA urgently needed to build a unified data-driven knowledge and intelligence system to support government operation and management systems, improve the intelligent support level of cross-department city planning, support

**LETDA in Northern China's Hebei Province and Huawei have built a data-driven 'Smart Brain.' LETDA's smart brain, known as an Intelligent Operation Center, uses new technologies to implement area-wide situational display and coordinated management, laying a foundation and making a breakthrough for overall Smart City development.**

policy formulation, and assist decision-making.

### **1 Brain, 2 Coordinations, and 3 Capabilities**

LETDA and Huawei's 'Smart Brain' features the '123 Standard': 1 brain, 2 coordinations, and 3 capabilities. The area uses new technologies — such as Internet of Things (IoT), big data, Artificial Intelligence (AI), and cloud computing — to construct an IOC for the Smart City, realizing area-wide situational display and coordinated management.

- **1 Brain:** As the digital brain and nerve hub of the government's management services, the IOC in LETDA uses existing information foundations, such as the government network, the Internet, IoT, the city's big data platform, and its video networking integration application service platform. On these foundations, the IOC can sense the city's dynamic running status, building a scientific big data index system and analysis model, and performing timely alarm and prediction functions, providing decision-making analysis support for city managers to implement efficient and effective governance.

- **2 Coordinations:** First, the IOC allows the coordination of area-wide resource information, including material resources, data resources, and human resources. The resources are integrated into the IOC and become the foundation of the city's management capabilities. Second, the coordinated construction of a set of operation mechanisms enables cross-level, cross-departmental, and cross-service management and collaboration. Meanwhile, a set of IOC operation and management mechanisms featuring dynamic perception, intelligent alarm, collaborative governance, and comprehensive evaluation, addresses the issue of fragmented city governance.

- **3 Capabilities:** The three capabilities — operation monitoring

and perception, scientific analysis and decision-making, and collaborative city governance — support the IOC's operation management.

Operation monitoring and perception enables the dynamic perception of the city's overall information, displayed on a screen. Scientific analysis and decision-making offers support for the government's management service departments. Finally, collaborative city governance allows dynamic display — on a screen — of various events in the city's management services, providing monitoring, perception, alarm, management, analysis, and evaluation of various events that occur in the city.

The construction of the IOC for the government's management services allows dynamic, comprehensive and real-time access of various events in the city's management services through multiple channels. In this way, the government can monitor, perceive, alarm, manage, analyze, and evaluate various events that occur in the city, enact the 'Internet Plus' Action Plan, as well as improve intelligent collaborative city governance capabilities, with increased efficiency and fewer layers of management.

The IOC's '1 Brain + 2 Coordinations + 3 Capabilities' will help LETDA reach a new level in terms of the scientific, refined, and intelligent management of the city.

### **IOC Benefits from Urban Data**

The IOC for the Smart City processes urban data in a visualized manner. It plays a significant role in promoting the area's economic operation, environmental protection, city governance, and people's livelihoods.

- **Economic operations:** The economic operations section

innovatively enables the comprehensive perception of the city's economic operational status, allowing decision makers to efficiently implement macro- and micro-level control. For example, based on big data analytics, LETDA has taken measures in several aspects — including technological innovation, energy saving, and emissions reduction — to overcome economic weaknesses. The government has also deployed innovative industries, attracted talents, and strengthened the government's support to help implement many projects. All these measures have greatly improved the area's overall economic vitality.

The government can monitor the economic operational situation from multiple angles, including the speed, quality, structure, and level of innovation. The area can use the multi-dimensional display of this information to provide comprehensive support for decision makers, attract targeted enterprises, make valuable investments, and accelerate the transformation of the area's industrial structure. Indeed, the area has formed four emerging industry clusters: electronic information; comprehensive culture and comprehensive health; new materials and new energy; and high-end equipment manufacturing. The four clusters include 104 enterprises and account for only 2.5 percent of the total number of enterprises, but they contribute 50.2 percent of the total tax in the area. Meanwhile, the energy conservation and environmental protection industry, high-end equipment manufacturing industry, and new material industry have been developing rapidly. The number of enterprises and the tax output value are both growing rapidly, and several outstanding enterprises have emerged.

- **Environmental protection:** Based on a Geographic Information System (GIS) map, the IOC displays distributed monitoring sites of the environmental protection agency in the area (such as air quality monitoring stations and river water quality monitoring sections), as well as sources of major environmental hazards and hazardous waste disposal units. The IOC can monitor and display the real-time running status of these sites, displaying real-time monitoring data and showing data fluctuations at each site. The construction of the

environmental protection map enables visualized environmental supervision, standardized performance evaluation, and scientific environmental decision-making. As a result, the area's atmospheric environment has noticeably improved, the concentration of major pollutants in the watershed has decreased annually in recent years, and the greenbelt coverage index has surpassed that of the Beijing-Tianjin-Hebei Metropolitan Region.

The quality monitoring of river water is a prime example. A monitored section of Fenghe River Basin in the area generated an alarm, indicating that the concentration of major pollutants was rapidly increasing. The alarm information was transmitted to the area's IOC and displayed on the monitoring screen. When they received the alarm, environmental protection agency personnel immediately activated the video surveillance system and water sensors to monitor the real-time pollution status, and dispatched staff to identify the source of the pollution. With the all-round collaboration and linkage of the intelligent monitoring system, the environmental protection agency quickly handled the incident — achieving immediate incident discovery, dispatch, and handling.

- **City governance:** The 'city governance' section accesses various city events, such as social safety, city management events, production safety, and fire safety, realizing panoramic monitoring of city governance and real-time tracking of objects. For example, the government can connect to the systems — such as the area's big data, mayor's hotline (12345), and comprehensive law enforcement — to view various events occurring in the city on any given day.

The IOC geographic information platform allows emergency response departments to easily receive, verify, and handle reports of emergencies. For example, when receiving an alarm reporting a fire near a company in the area, on-duty personnel can quickly use the system's location retrieval function to automatically locate the incident. The video surveillance system then enables staff to quickly check the situation around the incident location and improve the emergency check efficiency. Once the incident is confirmed, on-duty personnel can quickly obtain related information, such as whether there are any

schools or hazardous chemical enterprises located within the affected area; immediately notify relevant parties about evacuation; and inform fire rescue workers of the location of fire facilities and other emergency resources nearby, to assist with rescue operations. The area has also effectively improved the level of city governance through strict controls over petitioning (the administrative system for hearing individuals' complaints and grievances in China), comprehensive law enforcement, fire safety, and production safety.

- **Livelihood and happiness:** The 'livelihood and happiness' section enables the analysis of the comprehensive livelihood and happiness status of the people living in the area, combining nine metrics: the residents' happiness index, government services, education environment, medical environment, social security, employment security, culture and sports, ecological environment, and transportation. LETDA hopes to improve people's livelihood through comprehensive and systematic social policy innovation, and realize various social undertakings, to establish a livelihood development system that is rich, healthy, and happy. In the *Thirteenth Five-Year Plan* (which covers 2016 through 2020), Langfang states that it will strategically focus on "the comprehensive security and improvement of people's livelihood." IOC data shows that the residents' happiness index has been rising over the years; the health index, welfare index, civilization index, and ecological index are also showing good progress.

The IOC for the Smart City presents the area's overall situation in a panoramic display, fully explores and analyzes data values, and drives scientific decision-making with data, embedding a 'Smart Brain' for LETDA's social development.

### IOC Enables LETDA to Become a Smart City Area

LETTA's development of the IOC is still ongoing. In the future, the IOC will access more urban operations data and applications, to optimize decision-making processes based on the city's big data, thereby playing a more important

### LETTA: Building a Data-Driven 'Smart Brain'

- *Smart Brain: Constructing **1** brain + **2** coordinations + **3** capabilities for the Smart City, realizing area-wide situational display and coordinated management.*
- *Economic operations: Forming **4** emerging industry clusters, including **104** enterprises, contributing **50.2** percent of the total tax in the area.*
- *Environmental protection: Constructing **1** environmental protection map enables visualized environmental supervision, standardized performance evaluation, and scientific environmental decision-making.*
- *City governance: Accessing various city events, such as social safety, city management events, and fire safety, realizing panoramic monitoring of city governance and real-time tracking of objects.*
- *Livelihood and happiness: Enabling the analysis of the comprehensive livelihood and happiness status of the people living in the area, combining **9** metrics: the residents' happiness index, government services, education environment, medical environment, social security, employment security, culture and sports, ecological environment, and transport.*

role in government decision-making, the city's economic development and governance, and well-being of its residents.

Speeding up the construction of China's first-class digital park and Smart City is an important part of LETTA's mission to improve its development level; it is also a powerful tool to optimize its business and development environment. It can help enterprises in the area accelerate digital transformation and with industrial upgrades, cultivate new development momentum, and provide impetus for the development of the area's economy.

Huawei has vast experience in constructing Smart Cities, with its solution serving over 200 cities in more than 40 countries. LETTA is cooperating with Huawei to build the IOC for the Smart City. This cooperation lays a foundation and represents a breakthrough in the overall development of the Smart City. ▲



# Huawei Horizon Digital Platform Enables Smart Chengyang's Development

By Liu Yibing

**C**hengyang District in Qingdao, a beautiful and very livable city on China's east coast that has clear skies for 347 days per year, is at the forefront of the district's Smart City construction. Though it is relatively small with an area of only 378 square kilometers and a resident population of 1 million, Chengyang's economic development is impressive, largely because of its strong manufacturing industry; Smart City construction, which has become a major focus in recent years, is also a substantial contributor.

Largely owing to the success of its two main industries, Chengyang achieved a total output value of CNY 107.9 billion (about US\$15 billion), a general public budget revenue of CNY 11.25 billion (about US\$1.56 billion), and a per capita disposable income of CNY 51,594 (about US\$7,228) in 2018 — ranking tenth, fourth, and seventh respectively among Shandong Province's counties (cities and districts).

Chengyang's manufacturing industry is largely focused on vehicle production. Over 60 percent of China's high-speed railway trains and more than 25 percent of its urban rail and subway trains are

manufactured here, including the Fuxing bullet trains. Meanwhile, production of a prototype of the maglev train with a maximum speed of 600 kilometers per hour has been completed here, and that model is expected to be put into commercial use in 2022.

Chengyang attributes its development impetus and achievements to science and technology. "A city not led by science and technology is a second-rate city at best, even if it has a good economy and a large scale," said Wang Qingxian, a member of the Standing Committee of the Shandong Provincial Party Committee and Secretary of the Qingdao Municipal Party Committee.

## Huawei and Qingdao's Chengyang District have developed a proposal for new type of Smart Cities, and devised a three-phase plan to help Chengyang become a benchmark for Smart Cities in China.

A few years ago, Qingdao set three strategic targets: invigorate the city by holding the *Shanghai Cooperation Organization (SCO) Qingdao Summit*, become a modern international metropolis, and play a critical role in Shandong's opening up. To meet these targets, Qingdao launched 15 campaigns that had three main goals. One of those goals is to learn from and replicate the achievements of Shenzhen (which is regarded nationwide as a leading city in opening up and development). Another target is to make the city a new strategic pivot for deepening the opening up in the region north of the Yangtze River. Lastly, Qingdao aims to build a new platform for international cooperation under the *Belt and Road Initiative* — a program devised by China in 2013 to connect Asia to the rest of the world through regional integration, trade, and economic growth.

As an innovative and forward-thinking district, Chengyang has resolved to work with Huawei and capitalize on the strengths of Huawei Horizon Digital Platform — such as its data convergence capabilities, Artificial Intelligence (AI)-based security, and support for application innovation. Together, the two parties will take the initiative in Smart City construction and contribute to the development of an open, modern, and dynamic Qingdao.

### Becoming a Benchmark for Smart City Construction

While manufacturing remains its key industry, Smart City construction is critical to Chengyang's development and its residents' livelihood.

“We have created a fertile ground for the development of Smart Cities. We hope partners at home and abroad can join us to seize the opportunities in the smart era and build a new model of Smart Cities across the country,” said Wang Bo, Secretary of the Chengyang District Party Committee and Secretary of the Qingdao Rail Transport Industry Demonstration Zone Working Committee.

Huawei is helping Chengyang to make this dream a reality.

Huawei began its collaboration with Chengyang by undertaking an extensive research project to learn about the needs of local organizations and residents. Through face-to-face communication, a survey on service systems' requirements, workshops, guidance from experts, and researching documents, Huawei gained a comprehensive understanding of Chengyang's IT infrastructure, application systems, and data resources, collected the data sharing and application requirements of each organization, and identified the common needs, business difficulties, and decision-making pain points that residents, enterprises, and government agencies experienced.

A new type of Smart City must embody the people-centric development concept, that is, it must serve the people who live in it. With that aim in mind, Huawei conducted detailed and comprehensive research, developed the *Overall Planning and Design of New Type of Smart Cities* with Shenzhen Smart City Big Data Research Institute and Chengyang District, and proposed a three-phase plan:

- **Phase 1 (2019): Lay the Foundation and Achieve Initial Results**

Build infrastructure, develop applications that suit the district's characteristics, and carry out key projects based on their importance.

- **Phase 2 (2020): Show Highlights and Present Value**

Focus on smart education, healthcare, and community, as well as comprehensive governance by following the overall architecture design and considering the district's actual situation to meet urgent needs of government agencies, enterprises, and residents, and present the value of Smart City in people's livelihood services, governance, and industry and economic development.

- **Phase 3 (2021): Form a System and Set a Benchmark**

Expand the area covered, build on the results achieved in Phase 1 and Phase 2, increase new construction, realize the Smart City construction vision, and help Chengyang become a benchmark for



**Chengyang District is now undertaking the Phase 1 tasks. The initiatives can be summarized as “six ones”:** *one network for interconnection, one database for data aggregation, one map for data coordination, one screen to display the district’s security status, one cloud to serve the whole district, and one click for resource commanding and scheduling. >>*

Smart Cities in China.

### **Building a Unified Infrastructure Support Platform**

Chengyang District is now undertaking the Phase 1 tasks (“laying the foundation” is the priority at this stage). This entails integrating existing infrastructure and building a unified urban infrastructure support platform based on Chengyang’s business plan and Huawei Horizon Digital Platform to coordinate cloud computing; big data; a Geographic Information System (GIS); hybrid video; Internet of Things (IoT); and integrated communications, and enable each user to access them on demand.

Wang Bo summarizes the initiatives as “six ones”: one network for interconnection, one database for data aggregation, one map for data coordination, one screen to display the district’s security status, one cloud to serve the whole district, and one click for resource commanding and scheduling.

- **One network for interconnection:** Smart Chengyang’s entire network consists of three parts. The first is the core part that covers government affairs and security management. The second concerns various accesses, including providing unified Internet gateways to connect with the Qingdao e-Government extranet; access to various government departments, offices, and bureaus; and video access. The third is the data platform network, which is divided into three parts based on the business it is focused on: governance data, industry data, and video cloud data.

- **One database for data aggregation:** Build the Smart Chengyang big data sharing and exchange platform and basic databases, such as the population database, to promote the open sharing of data resources, break the barriers of data sharing among various government departments within the district, open data interfaces to interconnect with upper-

level platforms and databases, and improve data application.

- **One map for data coordination:** Use the GIS map to associate databases about time and space with the basic population, legal entities and macro-economy databases, and the public database of government affairs — to manage and release data.

- **One screen to display the district’s security status:** The video cloud platform integrates the intelligent cameras of government agencies at each level to support activities such as public security protection, city management, and anti-terrorism operations; effectively improve the efficiency of public security services; and safeguard the city. Instead of relying on manual detection, the platform analyzes the key information in the video, which lowers labor costs and improves efficiency.

- **One cloud to serve the whole district:** Two regions are divided based on service scenarios, including big data, GIS, Intelligent Operations Center (IOC), government affairs, and apps to provide cloud host and cloud hard disk services. Users can apply for cloud services as needed. Based on the operating status, the system allocates resources to achieve rapid service provision.

- **One click for resource commanding and scheduling:** Build a modern command system featuring efficient interaction and operation by integrating multiple service systems. The system integrates broadband/narrowband, wired/wireless voice, wired/wireless video, mobile video, and teleconferencing video, and supports the association of the GIS platform with the professional systems of various terminals to achieve visible, interactive, and effective resource commanding and scheduling.

As well as the six ones, the *Overall Planning and Design of New Type of Smart Cities* also defined eight tasks: building a unified portal for Smart Chengyang, developing an efficient online and

## Qingdao's Chengyang District: Becoming a Benchmark for Smart Cities in China

- *Infrastructure: Building a unified urban infrastructure support platform based on Huawei Horizon Digital Platform.*
- *Smart Agriculture: Propelling **4** new industries and markets worth hundreds of billions, including digital management of farmland, smart agriculture, integrated development, and international interconnection.*
- *Smart Industry Ecosystem: Relying on Huawei's global influence and ecosystem of partners, Chengyang has become a hub for smart industries. **10** enterprises have registered and established their branches, **7** enterprises have signed contracts with the district.*
- *5G Industry and Applications Development: Building the first 5G Smart Street Light Demonstration Road which is **1.9** kilometers long and has a total of **105** smart street lights with **6** functions — smart lighting; security monitoring; Wi-Fi access; USB charging; and providing a 5G interface.*

offline government approval system, building a public government service platform, setting up a service hotline for citizens, creating smart applications, building smart communities, constructing smart campuses, and developing a refined government management system. These tasks will gradually be implemented in the second and third phases.

### Promoting the Development of Smart Industries

As well as the high-level planning and design for a new type of Smart City, Chengyang also has a healthy ecosystem that is conducive to developing smart industries. Based on this development ecosystem and Huawei's interconnected and intelligent evolution ecosystem, the two parties have cooperated to promote cross-industry convergence and achieved staged achievements.

#### • World-Leading Smart Agriculture

Starting with a saline-alkaline soil amelioration demonstration project, Chengyang District conducted in-depth cooperation with Huawei and the team led by Yuan Longping, a Chinese agriculturalist who is known as the "Father of China's Hybrid Rice," and established Huawei Global Innovation Center for Smart Agriculture, which is dedicated to creating a comprehensive farmland program.

During the project, Huawei's Rotating and Acting CEOs, Guo Ping and Ken Hu, visited Chengyang and spoke highly of the district's prospects. The implementation of the joint development plan for smart agriculture application solutions (represented by the Jiutian Chip and Houtu Cloud) promoted cooperation between Huawei and Chengyang as they focused on building a global agriculture

technology platform and a smart agriculture ecosystem. The Houtu Cloud has been put into operation, and the State Department of Agriculture called it "the best agricultural cloud in China." A prototype of the Jiutian Chip has been produced, and it was put into mass production in the fourth quarter of 2019.

In the future, Huawei and Chengyang will jointly promote the *Belt and Road Initiative* and cooperate with SCO members to highlight China's exports, such as its chips, its technologies, and its rice products; it will also present the 'Chinese Dream' to the world, and propel four new industries and markets worth hundreds of billions, including digital management of farmland, smart agriculture, integrated development, and international interconnection.

#### • The Smart Industry Ecosystem is Thriving

Relying on Huawei's global influence and ecosystem of partners, Chengyang District and Huawei have built a smart industry ecosystem in Chengyang, and planned for new momentum, facilities, and lifestyles to promote the development of both smart industries and the city as a whole. Indeed, Chengyang has become a hub for smart industries. The district has witnessed the development of big data industry projects, smart enterprise headquarters, and industry incubation platforms, and initiated a global smart ecosystem demonstration project. Ten enterprises, including Ledor Spatial Information Technology Corporation and Beiming Software, have registered and established their branches here. Seven enterprises, including Shenzhen Audaque and Guangdong Intelligent Robotics Institute, have signed contracts with the district. NationSky also established its digital innovation center headquarters in Chengyang.

The district is committed to promoting the digital economy with AI and Smart City as its core, and aims to build two “unicorn enterprises” within five years.

### • Accelerating 5G Industry and Applications Development

Chengyang District implements new development concepts and innovative development strategies, and will embrace the 5G and the Internet of Everything (IoE) era, and will focus on “industry, innovation, and application.” The district is also producing high-level 5G development plans. It will construct high-quality 5G infrastructure; build a 5G industry ecosystem; and create a 5G demonstration area, an industrial development cluster, and an innovation application demonstration area.

With the district’s help, Huawei capitalized on its position as a leading 5G provider and built the first 5G smart street light demonstration road, on Chenyang’s Great Wall South Road. The demonstration road is 1.9 kilometers long; it has a total of 105 smart street lights equipped with 21 LED displays, 20 Wi-Fi access points, and 10 cameras. With six functions — smart lighting; security monitoring; Wi-Fi access; displaying information using LEDs; USB charging; and



***Relying on Huawei’s global influence and ecosystem of partners, Chengyang District and Huawei’s partners have built a smart industry ecosystem in Chengyang. Ten enterprises have registered and established their branches here. Seven enterprises have signed contracts with the district. >>***

providing a 5G interface — it has become a pioneer in Smart City construction and illuminates the future of Smart City development.

Chengyang District also cooperated with China Unicom’s Qingdao branch to build a 5G innovation building — the first indoor environment to deploy 5G in Shandong Province — and it will strive to build an influential 5G innovation industrial park in China.

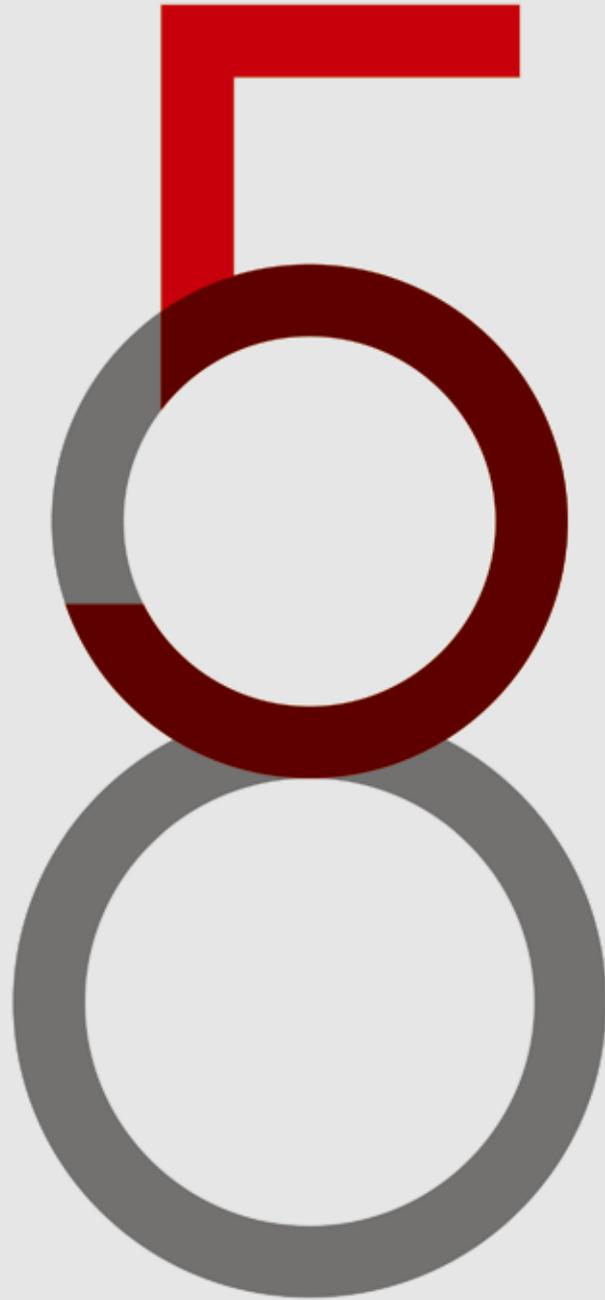
### Smart Chengyang: Future-Oriented and Intelligent Evolution

The purpose of Smart Cities is to implement the people-centered urban development concept, achieve more effective governance, scientific decision-making, and efficient public services, and improve the modernization level of governance systems and capabilities. This is a continuous and gradual process that cannot be accomplished overnight. The construction of Smart Cities will become more complex as technology develops, so decision-makers need to keep pace with the times.

Though Chengyang District has a comprehensive plan for the second and third phases of Smart City construction, this process is not fixed: It will evolve based on the development of ICT technologies, changes in business needs, and people’s aspirations for better lives. This process ties in with the concept of “intelligent evolution and platform adaptation,” which Huawei advocates for Smart City construction.

As Chengyang looks ahead to phases two and three of the Smart City plan, Wang Bo believes the district will provide efficient and high quality services, and support local enterprises to help them develop. By combining its own advantages with those of Huawei Horizon Digital Platform, Chengyang is set to evolve into a district that exemplifies the best practices of the new type of Smart Cities. ▲





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