Activating Intelligence
Smart cities and smart agriculture

Industry and smart city experts from around the world gathered at HUAWEI CONNECT 2018 to explore how artificial intelligence (AI) is being harnessed to build smart cities. Cases in focus at the Huawei event included the TEDA system, which applies the Intelligent Operations Center (IOC) and four large-scale AI platforms for Tianjin's Binhai New Area; land digitalization to smartify agriculture in Qingdao; and the case study of Germany's Duisburg, where cloud computing and IoT are making the city smarter and more attractive.

Smart City 智慧城市

IoT-Based Cities: Weifang and Yanb
物联城市：从潍坊到延布

The new AI engine driving smart city development

China's urbanization rate has risen 37 percent in 37 years, bringing a host of challenges for urban areas, including traffic congestion and pollution. Driven by services and technology, smart city construction has emerged as a solution to these problems. Service drivers comprise customers, service requirements, and architecture, while technological drivers include AI, data, and cloud. Collaboration in terms of these drivers are key topics today.

Cities have numerous requirements and a vast range of services, with no single company able to provide all. A city is much like a human being in that it needs a brain and nervous system to perceive, see, and think. According to Dr. Zheng Zhibin, President of the Global Smart City Business Department, Huawei Enterprise BG, "Huawei is committed to becoming a Smart City enabler and promoter by providing cities with a 'nervous system'.

Based on its Platform + Ecosystem strategy, Huawei is currently developing the +AI Smart City Digital Platform." The platform is based on Huawei's ICT infrastructure and, through an industry enablement platform, integrates five main resources: IoT, big data + AI, video cloud, Geographic Information System (GIS), and converged communications. Huawei has also joined forces with its partners to build platform ecosystems.

Practical application shows that a digital platform featuring resource coordination is vital for the sustainable evolution of smart cities. A powerful AI engine not only helps strengthen a city's nervous system, but also enhances its self-learning and self-evolution capabilities.

Oleg Logvinov, the chair of IEEE P2413, believes that technological advancement is a key driver of urban development, with AI at the core of smart city development. City managers have been harnessing AI in urban planning, public safety, transportation, and energy to help them make scientific decisions and create new digital economic models.

> **The smart city system usually originates from the service layer and, in the past, data systems were used to support service systems. But this actually wastes the value of data.**

Tianjin: AI + Smart City

Spread over 2,000 square kilometers, Tianjin's Binhai New Area (BNA) has a population of approximately 3 million and a GDP of around 700 billion yuan. At the heart of BNA lies the Tianjin Economic-Technological Development Area (TEDA).

The development of TEDA has reinforced the fact that the merger of smart cities with big data is inevitable. The company TEDA was founded in 2007, with the aim of building simple government administration platforms. But by 2017, TEDA had developed to the point that the smart city builder now faced a bigger challenge: building a big data system.

TEDA's smart city system is divided into three layers. On top is the service system, which includes various departments, such as approval, public transportation, and healthcare, as well as integrated platforms, including cross-departmental systems, which provide services and management for enterprises and residents. Below this is the data information layer, which comprises data aggregation and analysis capabilities. Then under this layer comes the support system layer.

Traditionally, this is the cloud and network, but when it comes to building a smart city with big data, the data platform has higher priority.

The smart city system usually originates from the service layer and, in the past, data systems were used to support service systems. But this actually wastes the value of data. Data can directly generate value through AI, and not just through application platforms, by providing more direct services for governments, enterprises, and residents under an architecture that bases smart cities on AI and big data.

Huawei helped TEDA design an AI-based 1+4+N solution, comprising one IOC, four AI platforms, and multiple applications. Huawei's IOC functions like a city brain. The IOC processes, communicates, and mines data collected about the government, enterprises, residents, Internet, and IoT. AI technology then enables deep analysis by this brain.

The IOC coordinates closely with the four AI platforms to support services such as Residents' Voices, Sensing the City, Healthcare in the Community, and Enterprise Services. Applications are based on the IOC and four platforms to develop a happiness index that

measures safety, beauty, convenience, harmony, civility, and vitality, with the aim of improving life.

Qingdao: Land digitalization for smart agriculture

China has just 120 million hectares of arable land and imports more than 50 percent of its food. The country also has 100 million hectares of saline-alkali land, of which between 13 and 20 million hectares has the potential to be transformed into fertile land to produce more grain. Seawater rice (salt-tolerant rice) can be planted on saline-alkali land, making it fertile land.

Led by the scholar Yuan Longping, the seawater rice strain was developed by the Qingdao Seawater Rice R&D Center, yielding in tests 9.3 tons per hectare in China and 7.5 tons per hectare in the Dubai desert. Yuan and his team want to transform around 6.7 million hectares of saline-alkali land into fertile land within 8 years. This would boost China's grain production by 30 billion tons a year and feed 80 million people — equivalent to a medium-sized European country and the number by which the population of China will increase over the next 20 years.

Soil digitalization based on Huawei's IoT system plays a vital role in the miracle of seawater rice cultivation. Sensors on or under the ground collect information such as illumination, temperature, and salinity/alkalinity, which is then sent to Huawei's cloud big data center over an eLTE network. Then, suggestions on recommended pesticides, directional fertilization, and pest and disease control are produced by the AI system, which in combination with expert diagnosis, helps to improve rice planting on the saline-alkali land and increase yields.

Yuan's team and Huawei have jointly planned and developed a fertile soil platform for smart agriculture, which is helping to move agriculture into the fourth of four development stages:

In the agriculture 1.0 period, everything relies on manual labor. Agriculture 2.0 is the use of agricultural machinery. Agriculture 3.0 is fully mechanized production. And agriculture 4.0 is defined by whole-region, whole-chain unmanned agriculture with minimal interference.

Yuan's team has three goals: step one, agricultural digitalization; step two, agricultural intelligence; and step three, the systemization of agricultural products.

> At the IoT layer, Duisburg will use Huawei's 5G, Wi-Fi, and WLAN technologies, and IoT platform to implement the real-time perception of city components.

Duisburg: Cloud computing and IoT

Duisburg is a city in the Ruhr Area of central Germany, one of the most densely populated areas in Europe. Ruhr is also a major steel production area, but due to the smartification of Duisburg, the number of steel workers in the city has plummeted from 70,000 to 16,000. Duisburg is transforming from an industrial city into a smart city, and needs to find new growth areas so it can adapt to the changing times. Smart city construction can help accelerate the development of Duisburg and improve citizens' lives.

Duisburg aimed to benefit from the opportunities provided by digitalization, using new ICT technologies to improve urban life experiences, promote economic growth, and attract more residents, enterprises, and investors. With its capabilities in technological innovation in cloud computing, big data, IoT, and AI, and its experience and strengths in helping cities determine their future directions of development, Huawei was a natural choice for Duisburg when it came to choosing a partner for its Smart City project.

At the cloud computing infrastructure layer, the Rhine Cloud supported by Huawei's technologies provides a basic platform for Duisburg's cloud strategy. It has driven technological innovation and the implementation of e-governance, transportation, IoT, and unified communications. With the construction of this smart foundation, Smart Duisburg 1.0 has been achieved.

At the IoT layer, Duisburg will use Huawei's 5G, Wi-Fi, and WLAN technologies and IoT platform to implement the real-time perception of city components. This will enable the construction of a connected nervous system network of urban facilities, such as transportation, logistics, power, and industrial manufacturing, facilitating the implementation of smart living, autonomous driving, smart traffic lights, smart parking, and smart city operations. This will help bring about the Smart Duisburg 2.0, a stage that will be based on smart experiences.

In another example, this time in education, Duisburg has also focused on smart classrooms, including WANs and broadband connectivity, as well as free Wi-Fi. The city leverages Huawei's experience in 5G, IoT, and broadband technology to implement smart logistics and Industry 4.0, which has helped improve the lives of Duisburg residents and make the city a more attractive place for investment.

Huawei is committed to being a doer in the field of smart cities, harnessing AI to lead new smart city construction. ▪▪▪