城市云脑计划白皮书

The City Cloud Brain Plan

Simple Version 2017

The Administrative Committee of
Wuxi National Hi-tech Industrial Development Zone
Hejun Consulting Group | Hede Innovation

Introduction

The city is an important place for human activity. It does not only serve the needs of the living, but even nurtures rich cultures. What's more, a city is home to gorgeous dreams. In this era, cloud computing, the Internet of Things (IoT), big data, mobile internet and artificial intelligence (AI) are all blossoming. Even city development has ushered in a new chapter in history, as represented by fairly successful new smart cities. Now these cities, featuring "Intelligent Infrastructure, Convenient Public Services and Delicate Social Governance," begin to be understood and expected by a growing number of citizens.

Xinwu District of Wuxi City aspires to be the first to respond to such expectations. With this in mind, we now present the "City Cloud Brain" Program and release *The White Paper on the City Cloud Brain Plan.*

As its name suggests, City Cloud Brain is a smart system that does not only thinks independently, but also develops and evolves constantly. That is no doubt the core of a smart city. Such Brain is a blend of IoT's sensation, Big Data's cognition, cloud computing's thinking and value view's belief based on Feifeng Platform. In fact, the layers of sensation, communication, data, platform and application are joined closely to form a unified Feifeng IoT platform, so that manpower and materials can be arranged for social communication and coordination. Therefore, livelihood affairs, government affairs, industrial affairs and so forth will be automatically sensed, handled, analyzed and executed by the urban governance idea, "Human Orientation." This Brain helps to ease "urban diseases," pinpoint governmental administration and boost industrial restructuring. Finally, a service-centered city will take shape to bring forth tremendous benefits and enormous convenience.

Hongshan will be the first to witness the pilot implementation of this

program. Hongshan IoT Town nestles within the National Sensor Network Innovation Park. This town, armed with excellent IoT facilities, is the first of its kind in China as well as one of the First Batch of Exotic Towns in Jiangsu. Its theme is “Continuing the Millennia-Old Wu Culture, Creating a New IoT Epoch,” and its goal is “Building a Sustainable Smart Town of Human Orientation, All-Around Sensation, Ubiquitous Network, Intelligent Integration and Endogenous Growth.” The pilot initiation at Hongshan marks an attempt at beginning from a small town and avoiding past barriers like data islands in line with systematic top-down design and unified standards, thus opening up a new path in this regard.

In this process, we create an innovative pioneering platform for enterprises to unleash their vitality and creativity, as guided by the government’s overall integration under the government-enterprise cooperation philosophy.

It will go a long way to witnessing either this town’s bright prospect or the Brain’s true maturity. Such unheard-of exploits involve a large team of aspirant, thoughtful and competent pathbreakers. With an open mind, they should overcome any difficulties and create a brilliant future through coordinated effort. Various enterprises and people from all walks of life are welcome to Hongshan! You are welcome to come here, build the Cloud Brain and usher in an IoT epoch together with us!

This Simple Version is meant to explain “Why,” “What,” “How to Build” and “How to Use.” After the original, translations in English, German and Japanese have appeared. For more information, please refer to the Full Version.

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I. City Evolution: Human-Oriented--the Underlying Permanent Tenet

Cities emerged to suit human needs. From its birth onwards, each city supports a large population and safeguards the people's safety, but also creates a social space and nourishes a splendid culture. It even brings glory and dreams. In the past century, however, extensive urban construction came under enormous attack due to a chain of problems such as fast urbanization, traffic congestion and environmental pollution. Various countries began exploring optimal modes of city management. Among those solutions, the "Smart City" no doubt garners the greatest attention. This concept owes its provenance to "Smart Earth," which US-based IBM proposed in its white paper Smart Cities in China in 2009. From 2010 onwards, the state and local governments of China have successively taken it as one of their development priorities. By June 2016, 95% of deputy-provincial cities and more than 76% of regional cities had stated clearly that they were building or would build smart cities. These account for more than half of the global total. It's obvious that China has become the largest "pilot arena" in this regard.

However, considerable problems arose in this process one by one: lack of planning, lack of coordination, piles of information-based systems, resultant waste of resources, redundant construction; lack of appropriate management modes, inefficient city management, unwanted separation of construction and operation, difficulty in sustainable development; presence of information islands, affected general data analysis and application, and inefficient functioning of big data in improving city management.

The root of all those problems lies largely in not having mature ideas about city construction and required technical support. From the perspective of theory and practice, such construction has three stages: "digital city," "intelligent city" and "smart city." The former two enable a city to go online by improving infrastructures and communication networks, and revolutionizing information acquisition and transmission; the final stage highlights that a city should not only be able to conduct self-regulation, but also be intelligent enough to arrive at coordinated governance and friendly interaction with human beings.

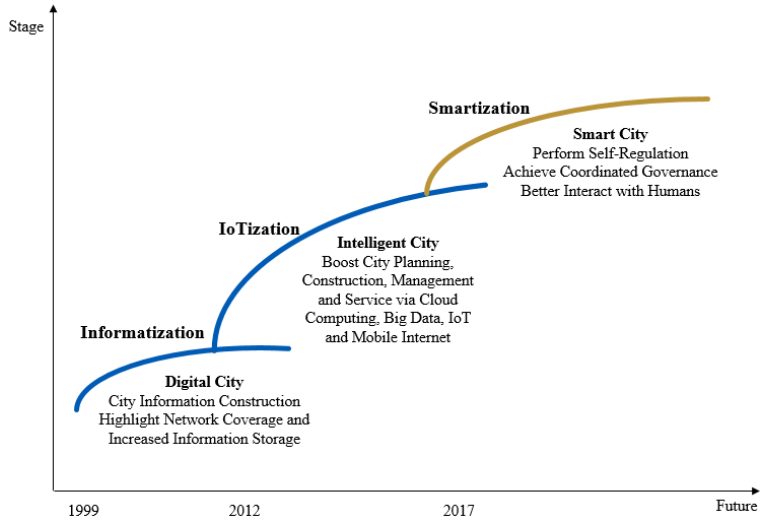

Fig. 1 The Three Stages of Smart City Construction

At present, China has just reached the second stage. Being "Intelligent" enables a city to use fuller policy support tools and more convenient governance means. But there is no simulated human intelligence available. Moreover, different data calibers, unwanted construction-operation separation, ineffective communication, and ineffective decision-making integration are all problems underlying the construction.

With extensive IoT experience and considerable construction achievements, Xinwu District absorbs the essentials of emerging technologies like cloud computing, IoT, mobile internet, big data and AI to respond to the state's call for building "new smart cities." Now, the district is crossing the threshold of "Intelligence" and aiming to become "Smart"—a stage of human orientation, self-perception, independent decision-making and autonomous evolution.

Under this context, "City Cloud Brain" comes rightly as expected.

II. Great Foresight: Advantages for Brain Construction

Hongshan is seated in Wuxi National Sensor Network Innovation Park. It benefits a lot from the district's tremendous development in IoTization and smartization. So, establishing "City Cloud Brain" at Hongshan is not a sudden decision, but a well-thought-out choice, considering the district government's years-long effort in IoT and go-smart. Practice proves that it is feasible to achieve this step by step.

1. Sensing China

In August 2009, Premier Wen Jiabao visited Wuxi and instructed the city "to quickly set up the Center for Sensor Information in China against the backdrop of heated global competition." In November of that year, Wuxi built the one and only National Sensor Network Innovation Park in China. That event marked a new era for Chinese IoT.

2. IoT Wuxi

From 2010 onwards, Wuxi enacted a series of development plans involving, among others, the National Sensor Network Innovation Pilot Park and industrial development. Wuxi has grown into an IoT highland. Wuxi was granted major awards of smart city evaluation for years on

end. To this day, Wuxi has always led the trends in China and abroad, thanks to cutting-edge fields such as IoT technology and IoT application.

3. Smart Xinwu

For Wuxi City, Xinwu District is a major economic growth pole, technical innovation base and restructuring engine. Smart Xinwu forms part of Smart Wuxi. Under the guidelines of "Human Orientation, Four Simultaneous, Optimal Layout, Eco-Civilization and Market First," the district tries to make itself a highly smart urban area of infinite sensation and innovation, which boasts upmarket industries, comfortable life, governmental efficiency, excellent environment and citizen safety.

Over the past years, Xinwu has boosted information infrastructures, especially in IoT. The "Optical Network New Area" initially took shape with 100% coverage. Some departments have completed information-based projects, covering almost all main fields of a smart city. No wonder the district has been a leader in Wuxi.

Throughout the province, it first built a Comprehensive Information Service Platform for City Management, an Overall Framework for Smart Governmental Service featuring "One Center + Three Platforms Plus N Applications," and "Xinwu District Comprehensive Service Platform for Dynamic Management." As of August 2017, the system had operated for more than 700 days and served more than 10,000 citizens, with available messages amounting to over 200 millions. There are over 1,300 projects managed, over 2,000 enterprises served and over 5,000 records updated to now.

4. Characteristic Hongshan

Hongshan is the first IoT town ever in China and one of the Exotic Towns. In November 2016, Wuxi officially released a plan stipulating

that Hongshan should, by the principles of "Innovation, Coordination, Green, Open and Sharing" and on the theme of "Continuing the Millennia-Old Wu Culture, Creating a New IoT Epoch," be made a smart town armed with Human Orientation, All-Around Sensation, Ubiquitous Network, Intelligent Integration and Endogenous Growth as a trail-blazing IoT cluster and IoT technology and application pilot area.

Hongshan is home to various industries: Over 50 IoT companies like Amway (China) Botanical R&D Center, Asia-Pacific Light Alloy Technology, Hodgen Technology, Shennan Circuits, Mobike; 4 of Global 500 and 9 listed companies; business giants such as Huawei, Alibaba, Cethik, Siemens, China Mobile and China Telecom arriving here in the nearly year-long period thanks to industrial facilities and future blueprint.

Considering the town's strategic orientation, superb location, natural, cultural and industrial wisdom, the Cloud Brain does not only tries to satisfy construction needs, but even aims to avoid inefficient implementation due to lack of coordination by applying unified top-down design and data calibers. At the same time, it should carve out a new path by breaking the start-big convention.

III. Feifeng: Top-Down Design of the City Cloud Brain

The program tries, under the tenets of "Opening, Embracing, Cooperating and Sharing," to create original examples of smart city construction, so that urban resources can be unleashed in a smart manner and urban service made quick and easy. Furthermore, it should not only be an open, innovative platform and data sharing environment that inspires new ideas, match new business modes, support new technologies and nourish emerging industries, but it should also become

a new-generation laboratory that is functional, productive and commercial.

1. Brain Meaning

The City Cloud Brain is the central system of a new intelligent city, integrating advanced information technologies such as cloud computing, internet of things, mobile internet, big data and intelligent technology. With these technologies, the system is capable of thinking independently whilst constantly evolving. Utilizing technology, through cooperation among different bits of infrastructure, sensors, communication technologies, background platforms and application layers, the cloud brain system can closely track data related to the civil service, people's livelihoods and industrial development, and make decisions following precise analysis. By doing so, the system will reshape the connection between human beings and services, cities, societies, resources, the environment and the future.

2. Brain Structure

The Brain's core functions are all based on the Feifeng Platform that consists of the layers of infrastructure, sensation, communication, platform and application.

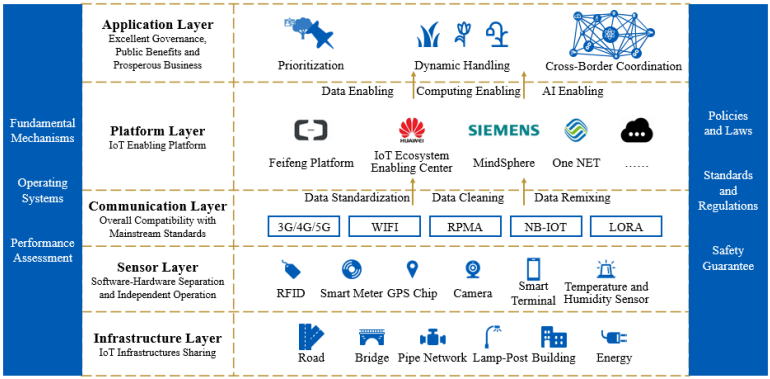

Fig. 2 The Overall Structure of City Cloud Brain

In light of human orientation and other values, the platform adopts information technologies like IoT, big data and cloud computing to make the Brain sense, know, think and believe. As a result, it will achieve all-around sensation, an ubiquitous network, integrated application and control security.

The “Infrastructure Layer” contains roads, bridges, pipe network, streetlights etc. These facilities can be switched on the City Cloud Brain via intellective reformation, maximizing efficiency, reducing cost, enriching data source.

The “Sensation Layer” fulfills all-around sensation and digital expressions like citizen/object identification, location, information acquisition, monitoring and controlling. This layer at the Brain’s core is no doubt a major source of various instant data flows.

The “Communication Layer” constitutes a network of convenient, steady and strong communication facilities by integrating mainstream technologies such as NB-IoT, LoRa, 4G and WiFi. The layer underlying information transmission and interaction provides a robust support for the Brain.

The “Platform Layer”, in fact, the Brain’s central smart platform and a “data-mine” with huge potential. Comparing, analyzing, integrating and visualizing mass data at this layer can help platform user to process data and satisfy needs of integration management; and as a common architectural basis, support development of various subsystems and subapplications.

The “Application Layer” abounds in specific applications and services so that the general public, enterprises and governments could use them directly. Consequently, enterprises, city and society can be smarter, more efficient in self-management and better in operation. Based on

platform and data layers and computing capability, various application developers come here to provide governments, enterprises and individuals with tailor-made delicate services.

3. Enabled Functions

If a city were a life-form, then IoT and relevant technologies would be "various organs" that help it sense sounds, visuals, positions, temperatures, chemical constituents and other messages; various network communication facilities would, similarly to a human's nervous systems, transmit information acquired via "those organs;" cloud computing would serve as the "nerve center" collecting all information via those nervous systems; big data would be the "nucleus" to integrate and mine data and make judgments and decisions for the coordination of any and all actions of the city.

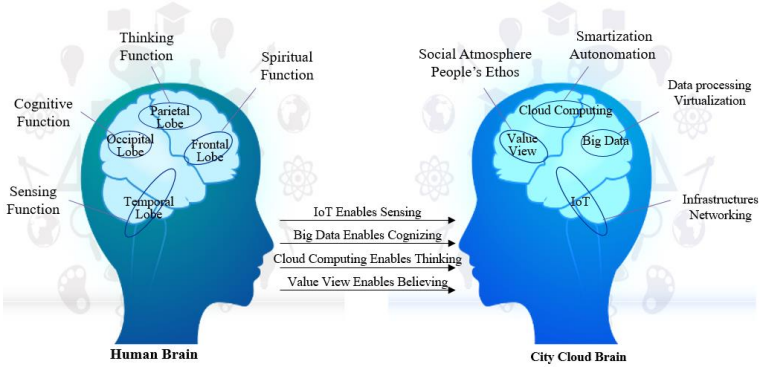

Fig. 3 The Four key points of City Cloud Brain

Enabled Sensing: IoT serves as the Brain's sensory nerve system. As the most demanded and most basic link, this system continuously transmits data to the Brain. The Sensation Layer consists of many sensors that function like a city's eyes, ears, nose, tongue and body. With the help of IoT technology, everything big and small in a physical city and various parts of its economic system can be informatized. The

Communication Layer serves to transfer all these data.

Enabled Cognizing: Big data system truly is the Brain's nucleus. By means of IoT, this system acquires various data of a city in operation and integrates such data and government/society's data to make it possible to achieve scientific decision-making and delicacy management. The total data does not only depicts all things of city operation and all corners of this city, but even precisely reflect all situations of this city. The nucleus in question even reorganizes and optimizes the raw data partly to make it better suited to subsequent analysis and application. Besides, there are data cleaning, staging and unstructured data structuring aimed at straightening out the data and allowing it to better serve subsequent value mining.

Enabled Thinking: Computing is the core of the entire Brain. In particular, cloud computing forms the Brain's "nerve center." The "central nervous system," as its name suggests, performs central computing. Take a closer look and you will find that the Platform Layer is the core of the nerve center. Its strong computing enables the town to think and supports it to fulfill specific applications. In brief, the layer boasts as-needed extension and retraction dynamics to facilitate resources segmentation, allocation, integration, storage and appropriate computing for the sake of the best energy-efficiency ratio.

Enabled Believing: The Brain should observe the beliefs or tenets of "Innovation, Coordination, Green, Open and Sharing" to integrate production, urbanization, humanization and culturalization.

Human Orientation: Emerging technologies greatly boost city construction. Yet, the original intent is to improve human life and production, so the Brain's sensing, cognizing and thinking should be all based on the "Human Orientation" idea. That is to say, the Brain should be service-oriented and humanized.

Ubiquitous Network: To sense and interact with the physical world, the Brain should, based on team and social attributes, focus on events rather than data. Smartization and networking should form the foundation to integrate information resources into physical reality so that the physical world can be managed in an active, well-organized manner.

Constant Evolution: By integrating big data, cloud computing, AI and other technologies, the Cloud Brain can learn, control and evolve on its own. Smart algorithms conduct self-circulation via the functions of its subsystems and adapt such circulation to a changing environment.

4. Specific Applications

Sensation, cognition, thinking and belief arm the Cloud Brain with great power and potential to form various application enrichments.

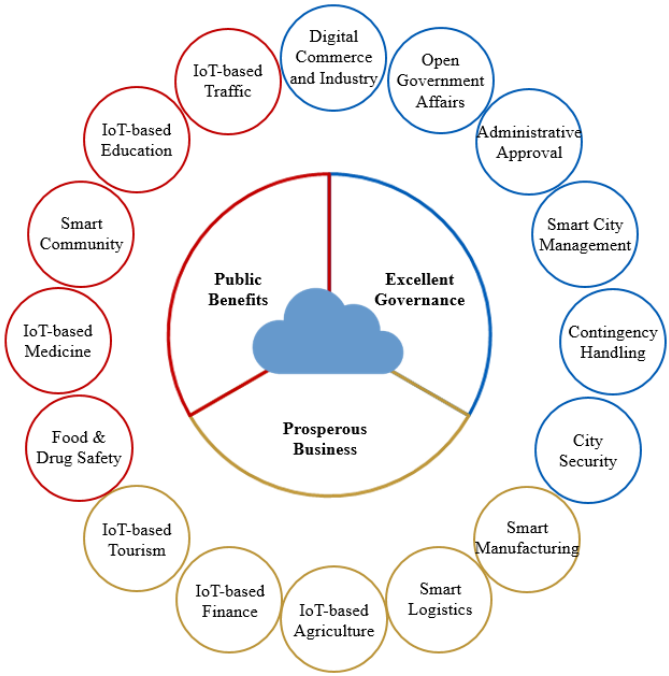

Fig. 4 The Application Development of City Cloud Brain

The Brain may delve into various applications under all scenarios and on all dimensions to make governmental decision-making scientific, social governance precise and public service efficient. Enterprises may sharpen arrangement efficiency and business vitality. Then the way everyone lives and works will be changed as well.

IV. Transition: Stage-by-Stage Implementation

Adhering to the Human-Oriented core philosophy, we unite different governmental and corporate forces in an overall integrated manner to carry out the Brain program in four stages: foundation, communication, sharing, evolution. During the entire process, all five layers mentioned above should support each other and coordinate with each other to evolve as a whole. Yet, each stage should have its own focus.

1. Specific implementation

1) Foundation

In this stage, we should boost infrastructure construction to make the Brain's architecture take shape.

Deploy Sensor Clusters: Prioritize sensor deployment involving preliminary pilot projects in environmental protection, city management, public security, traffic management, education, health, etc., to erect smart sensor clusters on traffic, ecology, energy sources, agriculture and public services; investigate and communicate with local enterprises, synchronize infrastructure construction with sensor layers construction at the same time.

Strengthen Communication Network: Build a communication network covering the entire town in a diversified, open, free and eclectic manner by putting together advantages of well-established technologies (2G/3G/4G, WiFi/ZigBee, BT/RFID) and emerging

LPWAN approaches (NB-IoT, LoRa, RPMA).

Erect the Platform Layer: Set up a unified, strong and smart platform of authority management, data mining and risk control to provide support for rich application subsets. And its construction will have two phases: phase one, erect the system's competence components; phase two, establish process flow and application development. Clarify access kit standards, standardized protocols, qualification certifications and other data standards to become the platform's support in data standardization as a guide to hardware access.

2) Mixing

The government should, starting from its own data, explore a new path of data communication and coordination by breaking two barriers—departmentalism and institutionalism toward the goal of intragovernment information openness and interconnection.

Conduct Government-Led Resources Integration: Construct a center for acquisition and management of big data resources and acquire such resources.

Sort out the Leading Group and Work Groups. Start integrating governmental data resources from the population database, legal people database, geography database, credit database and macroeconomy database. Standardize data source standards and acquisition mechanism to locate every data source for the sake of accuracy, integrity and avoidance of repeated acquisitions, and simultaneously update all data in real time. Then expand the scale by delving into other databases concerning environmental protection, finance, city management, public security, traffic management, education and health, to name a few.

Establish regulations for information safety management and reinforce such management on governmental information.

Standardize Communication: Clarify standards governing data communication and application.

Establish a data masking workflow and make well-defined principles, application scopes, processes and methods for the best possible masking of governmental data.

Establish and enhance standards for governmental data integration, provide clear-cut stipulations for various database sources and standards.

Establish and enhance governmental data directories, classify various public data in terms of sensitivity and magnitude as the criteria for data opening.

3) Sharing

Publicize the government's exploration experience via infrastructures, data and the platform to make people from all walks of life come to join us and build up a vibrant ecosystem.

Share Infrastructures:

Reshape the conventional mode of accepting software and hardware designs in an integrated manner. To ease off pressure, transform the vertical project initiation pattern into a new pattern of reusable infrastructures, in which variable software and permanent hardware are separated. In this way, entrepreneurs may enjoy a broader space for development.

Support the sharing of building structures such as roads, bridges and urban infrastructures like lamp-posts and the sharing of construction of infrastructures including communication links, sensing equipments, service terminals. Undertake the pilot implementation of relevant laws to establish and protect legislation infrastructures, especially information infrastructures.

Share Data:

Such data sharing is achieved by data transactions. Set up an IoT data transaction center to, as authorized by the government and protected by law, provide the general public with a range of supporting services like excellent data transaction, settlement, delivery, security, assets management and financing for communication's sake.

In accordance with relevant standards, incorporate private data like enterprise data into the public system to expand the coordination of sharing and tap into big data's political, commercial and civil applications.

Share the Platform:

Share Feifeng Platform to stimulate joining, evaluating, developing and managing itself; provide long-term operation support and marketing service to activate the platform ecology.

Set up a resources pool involving IaaS, PaaS, DaaS and SaaS to form an open cloud computing center that is safe, efficient, flexible and expandable. The center can then provide enterprises with infrastructures, support software, information security, operation guarantee and other services. At once, developers of the Brain will be empowered.

4) Evolution

Along with rich applications, improve AI technology to make the Cloud Brain get onto the right track. Stimulate various scenarios and establish algorithm models for continuous iteration, so that each and every field will have a "cloud brain."

Hongshan is a pilot IoT town in this regard. As it matures and operates well over time, the Cloud Brain, becoming more competent, should

grow bigger and stretch into broader domains.

2. Guarantee Mechanism

To ensure the orderliness of each stage, the district will carry out its work via a coordinated operation framework as guided by the Leading Group. Let laws safeguard the Brain's advent and real-scene innovations enrich its applications.

1) Coordinated Operation Framework

Leading Group: To perform overall integration, the district government will establish a Leading Group, which consists of main district leaders, members from various functional parks' administrative committees, subdistrict offices and district departments.

One Office-One Center-One Think Tank：

Standing Body: Office for the Leading Group of City Cloud Brain. This office simply is the standing body. The group should hold meetings here regularly so that the office can boost implementation of resolutions and routines, perform coordinated management and supervision improvement.

Resources Guarantee: Bid Data Resources Management Center. With the Data First idea in mind, the center will centrally manage data storage, handling and communication. Organize personnel to make standards and regulations on collecting, managing, communicating, opening, applying public information resources and so on, which may come to guide resources integration. Establish a security management and protection system for intensified data protection.

Market Operation: Jiangsu Smart Xinwu Information Technology plays a major role in demonstrating application import, investment attraction and platform operation. Both construction and cooperation come within the company's business scope. At present, it has helped finishing

district population databases, macroeconomy databases, geography databases, place-name/address databases and other databases and has explored integrating and sharing all these resources.

Policy Support: Think Tank. The town plans to found an tank with over 30 members, all of whom are experts from specialized institutions like the Chinese Academy of Engineering, Advisory Committee for State Information, universities such as Tsinghua University, Renmin University of China, Southeast University, and market leaders including SensingNet Group, Siemens, Huawei, and Alibaba Cloud.

Chief Information Officer (CIO): In 2009, Wuxi initiated CIO—a fruitful information-based system to ensure that the city can go smarter and smarter. During the Brain's construction, we will continue this system to make it a driver functioning behind the Brain's three stages. Each person plotting, planning, organizing or implementing specific schemes/projects should be directly responsible to his immediate supervisors at the concerned district/unit/department.

2) Guidance by Systematic Ordinances

The framework in question is a new force in the Brain construction. Systematic ordinances come as a standardized guide to those building the Brain.

Legislative Exploration: To address actual needs and problems, we push up Wuxi's legislation in regulating urban infrastructures sharing, data resources transaction, standards framework and other businesses, with Xinwu being the pilot district. Guide data clustering and communication, regulate the opening of infrastructures, data and the platform so that the Brain can get in place.

Initiative Guidance: As a further support for the Brain's construction,

we will enact *The Feifeng Initiative on Accelerating the Development of IoT-led New Generation Information Technologies* to boost the software-hardware infrastructure platform, speed up opening and sharing of common infrastructures and data resources and apply the Brain in both city governance and civil service.

Policies Implementation: We have promulgated numerous policy papers such as *Detailed Rules on Implementing Scientific-Technological Innovation and Entrepreneurship in Wuxi Hi-Tech Zone (Xinwu District)*, which pioneered the "Three-Stage Enterprise Model" for different enterprises. Also, we founded various special funds to support the pilot implementation of Jiangsu IoT Talent Cloud Big Data Platform and establish IoT Talent Database. In short, this location has been and will be steeped in a great policy environment.

3) Real Scene Innovation Practice

As one of boosts behind the Cloud construction, the World Internet of Things Technology Application Competition kicks off at Hongshan to better help IoT enterprises and entrepreneurs showcase the latest technologies and products, so that excellent IoT technologies and applications can be incubated at Hongshan.

The competition falls into two categories: technological schemes and technological applications. The former solicits cutting-edge and innovative entries while the latter unfolds as real-scene applications to provide diversified application scenarios like fish ponds, large fields, greenhouses, stone museums, national wetland parks.

V. Blooming–Multi-Dimensional Application

In light of the "Government-Guided, Market-Oriented" principle, we invite all people and organizations to jointly develop the Brain's

applications on various dimensions and thus build a “Smart City.” Thus far, we have pilot-implemented the concept to achieve good governance, excellent public benefits and prosperous business as part of the Brain.

1. Excellent Governance

Xinwu District will, based on the Cloud Brain, explore various dimensions such as government administration, city management and citizen service to unleash the Brain’s smart analysis and autonomous decision-making, so that the city can perform smart self-management and the community can perform coordinated autonomy for the sake of increased efficiency in resources application.

Government Administration: Improve the e-government platform by borrowing experience from Xinwu’s dynamic management platform. Various governmental departments should be interconnected across the e-government cloud designed on a basis of regulations, work procedures, document templates from such local departments at all levels. These attempts can facilitate interconnection, as well as correlated office and resources sharing between various civil servants for supervision by discipline inspection organs and the general public.

The E-government platform is a unified platform where local civil servants can work together, exchange ideas and gain knowledge. It records big data on all civil servants, autonomously pushes optimal schemes to units at all levels, and assists in reestablishing business processes for increased efficiency of both departments and workers therein. Finally, governmental governance will have more modern capacity and system.

City Management: Let’s take police work, for example. Form a multilevel security protection and control network using sensing infrastructures like electronic eyes to provide the police with real-time data, and reflect the security trend. Erect crime prediction models based

on the network data to pinpoint crime hotspots and possible venues for fighting crimes precisely. When any event or incident happens unexpectedly, dispatcher at the dispatch center can directly order a single police force and ask it to take action so as to follow up the event process in time, grasp key elements and locate the suspect list.

Citizen Service: Erect a "One-stop" Government Hall to address various citizen and enterprise needs via a general affairs service window and handle affairs involving various channels. On a basis of the hall's service data, optimize work procedure and improve work efficiency. By means of time sequence analysis, predict business needs within the coming period via a model and allocate personnel beforehand to face the hot need season. By performing interdisciplinary and interchannel comprehensive analysis, tap into people's service needs and continuously optimize resource allocation, enrich services and individualize push services, so that governmental service philosophy and pattern may be both transformed.

2. Public Benefits

The district has explored IoT applications in education, traffic, medical treatment, etc. and made considerable accomplishments. In the future, this district will arrive at coordination with the Brain in livelihood services to address increasingly personalized and diversified public needs and improve citizens' living standards.

IoT-based Education: The district will establish Brain-based schools of all levels. Their wide-covering network teaching environments, excellent digital education databases and ubiquitous IoT equipments would then be all available to improve teaching quality, management efficiency and resource leveling.

Many enterprises therein will support these schools. GClasscn's self-adaptive learning engine "Education Intelligence (EI)" based on

well-designed algorithms and mass data, for example, can be of great help to students in individualized learning. Wuxi Fantai Technology would perhaps establish an IoT-oriented Teaching & Research Base along with textbooks of its own IPRs.

IoT-based Traffic: The district will create a Brain-based comprehensive traffic management and service system to acquire, convert, handle, store and mine traffic data in real-time. This way, the transportation system will have much-improved efficiency.

IoT traffic enterprises will develop scenario-specific applications. Mobike has brought residents great convenience in riding shared bikes by use of "GPS-Smart Lock" pileless mode. Jiangsu Dayun Information Technology contrived "Passenger Station Smart Shift Acceptance and Check-in/Check-out System," then established RFID reader at Wuxi Passenger Bus Station in 2014. The reader can remotely read out each incoming/outgoing bus's electronic label information to perform routine inspection, acceptance, arrival reminding, parking space arrangement and other tasks automatically. To this day, the system has operated very well.

IoT-based Medicine: The district will establish IoT-based hospitals that come as an embodiment of the Brain's medical application. Specifically, establish a data-oriented service mode and achieve autonomous management. Those hospitals should acquire precise key data on the human body as time goes on, and establish data models to provide each and every patient with customized service. So, no emergency treatment will be delayed or emergency patient be wrongly diagnosed due to a lack of information. Even drug management would be made strict and complete.

Patient data including family history, medical history, examination result, treatment record and drug allergy will be written as electronic

health records. Via the information platform, a doctor can find all the information immediately to provide fast yet accurate personalized treatment schemes.

Jiangsu Mandala Software has taken a lead in smart hospitals. It proposed an "IoT-based interactive personal health management service," in which an IoT smart health service system should be erected to the effect that medical data, health records and IoT monitor data can be shared and accessed in a safe way. Up to now, Mandala has served more than 500 medium and large-sized medical institutions/departments nationwide as a leader in both electronic patient records and district medical data centers.

Wuxi BayNexus has devoted itself to conducting the research of IoT-based RFID technology. As a result, the "RFI hospital smart nursing system" took shape. With this system, smart devices such as wearable wristbands, handheld terminals, medicine cabinets based on IoT can help achieve automatic record-keeping, such as precise patient identification, nursing data acquisition and operation confirmation.

AstraZeneca, too, explores ways for performing whole-course patient-centered management. Analyzing big data can help common patients choose appropriate hospitals and provide emergency patients with the green channel to receive immediate operation wherever necessary. After patients' discharge from the hospital, their body functions will be traced via smart devices. Pilot-implement the scheme in Xinrui Hospital, Hongshan and expand its presence into other hospitals to improve Wuxi's IoT health sector.

3. Prosperous Business

The Brain is a catalyst to accelerate the change of the economic growth mode. The Brain enables SMEs in finance, tourism, sports and other industries to enjoy lower thresholds of emerging technologies. As

informatization quickens its pace, new economic forms are emerging.

IoT-based Finance. Relying on new-generation information technology represented by IoT, material flow, information flow and capital flow may become one flow. As finance shifts from the human-centered pattern to a material-centered one, the financial industry will reach a new height of being safer, more transparent, more convenient, more flexible and more timely in product service, business process, business expansion, risk control, etc.

SensingNet Group is a leader in objective credit assessment. Way back in July 2014, the group and Ping An Bank jointly released the Vehicle Pledge Management System and built virtual fences to centrally supervise pledged vehicle assets in real-time. When it came to June 2015, IoT application in steel trading emerged. Now the group holds the unique certificate issued for the IoT financial commodity trading center. Commodities such as vehicles, paper, steel and nonferrous metals are starting to be traded successively.

IoT-based Tourism: Under the "human-oriented" guideline, the town-specific tourist resources will be reshaped as the Cloud Brain gets opened and applied. Any need can be satisfied, be it for "food, accommodation, touring, travelling, shopping or entertainment." Tourists will enjoy all-around services including travel agencies, scenic areas, hawkers and hotels.

IoT-based Sports: Xinwu's IoT-based sports rank among the highest in China. Now it has implemented many demonstration projects like smart stadiums, smart wearable devices and smart fitness, engaged in researches on national sports IoT standards framework, and it has built a laboratory to conduct IoT inspections.

In 2015, Wuxi approved that "Wuxi Smart Sports Industrial Park"

should arrive at Xinwu. As the first of its kind in China, this park will blossom into a “hackerspace” in this regard. That year the park was included in the province’s 13th Five-Year Plan for sports development. In October 2016, Zhang Liang, Director of China Institute of Sport Science, signed a strategic cooperation agreement, which stipulates that all sides shall jointly push up IoT application and industrialization. Presently the park has attracted 35 enterprises in sports R&D, sport events, sport information service, sports health and suchlike, with the annual output exceeding RMB 100 million yuan.

Wuxi Fit Time Trade therein developed a fitness application called “FitTime.” The company initiated the remote health management mode, in which each bodybuilder logs in on his smartphone and scans a QR code at the IoT-connected device to test his physique. The resultant data will be automatically uploaded to a specialist service system and a professional coach will give an “exercise prescription” accordingly.

Xinwu’s such trials do not only make progressively more people exercise in a more reasonable, efficient manner, but they also help achieve “unattended operation” of more and more stadiums and gymnasiums.

Wuxi Haiyun Sport Development developed a home-grown IoT-based system monitoring the safety of swimming pools, which monitors water temperature, turbidity, pH value and residual chlorine simultaneously. If the water quality fails to reach the standard, a microprocessor will trigger a warning signal automatically. Jiangsu Hongyu Information Technology will develop a 200-mu Smart Sports Park as a pilot project, which mainly consists of a Smart Sports Complex, Outdoor Sports Facilities, Indoor Smart Sports Projects, and Fitness Trails.

VI. Fengming--Prospects of the City Cloud Brain

Integration between information resources and physical reality marks the advent of a new technology revolution. According to this revolution, a smart, green and ubiquitous Internet of Things is reshaping the global landscape... Come here to dream big and grow bigger! This millennia-old town is embracing new technologies, new products, new businesses and new formats. Hongshan is starting small, but will achieve greatness through the world!

As a language between various things, IoT is restructuring the human society so that “silent” things may speak, understand each other and showcase something grand or great. In a nutshell, they will be smart. A city is a system, a culture and even a life. It responds to advancing technology, yet concerns people’s livelihood. New-generation Hongshan IoT Town simply brings together technology and humanity.

On the doorway to a new era, the City Cloud Brain will unleash its functions as a new thing of the future city. Hongshan is a great test arena for IoT enterprises. In this place, the wildest ideas get respect, the newest trials gain understanding and the bravest enterprises garner attention. We are lucky enough to live in this epoch. And Hongshan is lucky as well to see IoT expand here.

A single drop of water doesn’t make a sea; a single tree doesn't make a forest. All the town’s bright prospects entail the concerted effort of all enterprises. So, please join us to achieve gorgeous dreams!

The Brain erects a test ground for innovating applications. Advanced infrastructures, widespread small and large sensors, strong and steady communication network and unified data interfaces are all robust supports in terms of IoT hardware. As the government first opens its

data and other sectors follow suit, this town becomes a leader in data communication, thus giving birth to considerable trading mechanisms and value-manifested data goldmines. On the “test ground,” application-oriented enterprises can wildly explore new IoT applications and products, as abundant software and hardware are available.

The Brain builds a state-of-the-art incubator. Following the advanced idea of separating software from hardware, Hongshan IoT ecosystem imbued with vim and vigor has a yearning for every technological advance. Industry-university-research institute integration, well-targeted preferential policies and industrial fund guidance all speed up the application of technology innovations. Here technology enterprises are the most sought-after of all. With this support, enterprises can break new ground and reach new heights on an ad hoc basis of market needs.

The Cloud Brain erects a platform for IoT enterprises. Located at the national park, Wuxi has got a crucial place in the IoT sector and in particular IoT economics thanks to decade-long IoT experience and leading smart city construction. The excellent achievements of innovative and pioneering enterprises enjoy the utmost acclaim, and the needs of growth enterprises have the utmost attention. Even local IoT enterprises can benefit from the platform’s shared fields. All enterprises are welcome here! Work hard together to open up a new chapter in IoT.


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