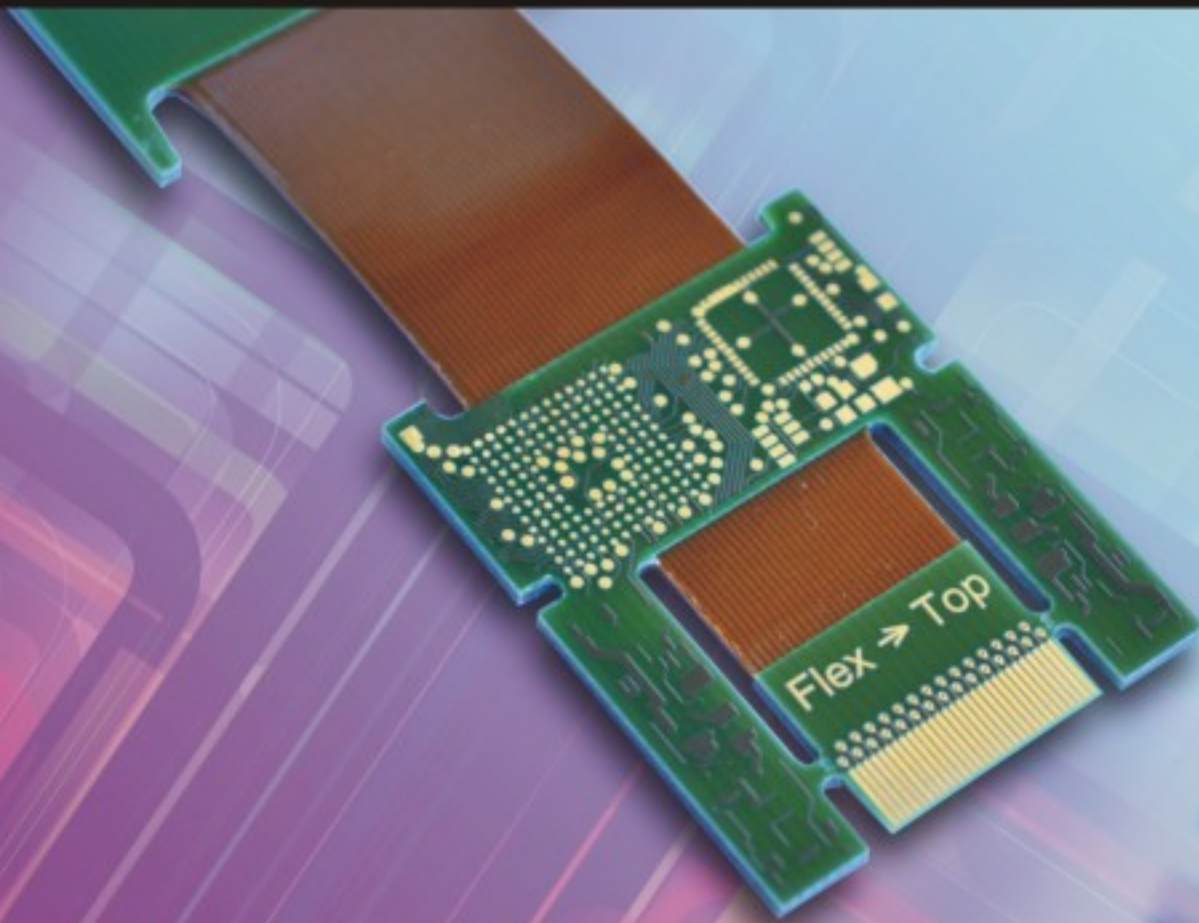


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Digital Sensors and Sensor Systems: Practical Design

Sergey Y. Yurish



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The goal of this book is to help the practitioners achieve the best metrological and technical performances of digital sensors and sensor systems at low cost, and significantly to reduce time-to-market. It should be also useful for students, lectures and professors to provide a solid background of the novel concepts and design approach.

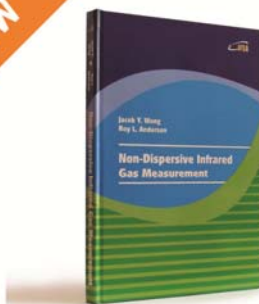
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The Platform Architecture and Key Technology of Cloud Service that Support Wisdom City Management

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Abstract: According to the new requirement of constructing “resource sharing and service on demand” wisdom city system, this paper put forward the platform architecture of cloud service for wisdom city management which support IaaS, PaaS and SaaS three types of service model on the basis of researching the operation mode of the wisdom city which under cloud computing environment and through the research of mass storing technology of cloud data, building technology of cloud resource pool, scheduling management methods and monitoring technology of cloud resource, security management and control technology of cloud platform and other key technologies. The platform supports wisdom city system to achieve business or resource scheduling management optimization and the unified and efficient management of large-scale hardware and software, which has the characteristics of cross-domain resource scheduling, cross-domain data sharing, cross-domain facilities integration and cross-domain service integration. *Copyright © 2013 IFSA.*

Keywords: Wisdom city, Cloud service, Cloud resource.

1. Backgrounds and Problems

With the city management transiting to the “resource sharing and service on demand” serving management model gradually, wisdom city is becoming a new mode of city development which is generally recognized at home and abroad, and it also makes the construction of public service platform for wisdom city become the focus of people’s eyes. There are not only information sharing and interaction requirements between multiple application systems in wisdom city system, but also various application systems often need the co-extracted data to calculate and present results comprehensively at the same time, thus needing a more powerful information processing center to process all kinds of information [4]. Therefore, the traditional data center with integrated service model can not meet the requirements of the wisdom city system construction. As a new mode of information

service, the cloud service, which is a service supply mode supporting heterogeneous facilities and resources sharing that based on network, with on-demand dynamic expansion ability and property investment high ratio (compared to the traditional data center, hardware investment at least down more than 30 %), is considered to be a effective way to solve the problems in wisdom city system construction at present.

At present, researches on wisdom city and cloud service mainly focus on the architecture of cloud service system which based on cloud computing industry. The typical system of cloud services for wisdom city includes: 1) E-government cloud management system, such as using the powerful processing capabilities of the data set of cloud computing platform, then through the comparison between urban planning map and remote sensing situation graph, which marks illegal constructions automatically and has statistical analysis.

2) Electricity cloud virtualization management system, which through cloud computing, collecting kinds of relevant data from power supply end to the client, and uploading it to intelligent power analysis and control center through the information exchanging network. Meanwhile, some of these information have to be integrated analysis and data mined so as to adjust the way of using the electricity aim at reducing the electricity costs to users. 3) Intelligent transportation system of cloud management, such as the intelligent acquisition of traffic information, flow, voice, pavement, traffic accidents, weather, temperature and so on, monitor and schedule all kinds of city's transport system to protect people, vehicles, roads and environment to exchange information closely, real-time and stably to improve the efficiency of the transportation system. 4) Intelligent tourism platform of cloud services, as Wu Xue defined: intelligent tourism is a kind of tourism which meet the requirements of the service and using end to handle the comprehensive information of tourism conveniently through the massive information storage and intelligent computing service which provided by cloud computing center which based on online service [5]. But overall, the existing wisdom city management system still faces the following problems: the application is limited in single domain, city management resources are too scattered, cross-domain data sharing has difficulties, lacking of unified resource scheduling, lacking of standard specification seriously and so on. Therefore, according to the new requirements of the construction of "resource sharing and service on demand" wisdom city system, research on the construction of wisdom city service platform which under the cloud services environment so as to achieve cross-domain resource scheduling, cross-domain data sharing, cross-domain facilities and service integrating.

2. The Overall Architecture of the Platform

In this paper, we put forward cloud computing service platform for wisdom city, as you can see the chart below. This platform system contains four levels including the resource layer, virtual layer, management layer and service layer, and its core is based on constructing a cloud service resource pool which uses the technology of virtualization and isomorphism to build a public service cloud model of wisdom city which is independent on the different departments application system in the original city management, and through the use of five management and through the use of management subsystems and its key technology to provide all kinds of public services including wisdom network service, wisdom urban management service and wisdom traffic service for wisdom city system users in IaaS, PaaS and SaaS three models [3]. The five

management subsystems are: storage system of cloud data, dynamic deployment system of cloud resource, dynamic scheduling system of cloud resource, dynamic monitoring system of cloud resource and security management system of cloud resource [1].

Among them, 1) The core of the resource layer is to enhance the storage capacity and the computing capability of the system effectively so as to meet the increasingly demand of wisdom city management through the existing hardware equipment together by virtual technology; It establishes various computing resource pool, storing resources pool, software resources pool on this basis through the heterogeneous software which are same or similar type and information resources which are isomorphic, in order to make wisdom city which under the cloud computing environment has the foundation of collaborative work. 2) The core of virtual layer is to virtualize one or more isolated execution environment to used for running the operating system and application; Accordingly, different application requirement of wisdom city management needs different types of exclusive cloud of wisdom city and public cloud service architecture which based on the integration of exclusive cloud so that the dynamic deployment of various resources of wisdom city system becomes more flexible and convenient, and the utilization rate of physical facilities resource also increases greatly. 3) The core of management layer is to take the responsibility for the dynamic storage of cloud data, dynamic deployment, dynamic scheduling and dynamic monitoring of cloud resource, security management of cloud service and other functions. Among them, the dynamic storage of cloud data support the dynamic and efficient storage of distributed data resources and computing resources, and can get a large number of different types of storage devices in the network together by the application of software to collaborative work and to provide external function of data storage and access [2]. The dynamic deployment of cloud resource support system provides standardized resource template so that users can choose application procedures, computing resources or storage resources module according to their requirement to get rapid deployment. The dynamic scheduling of cloud resources support virtual resources of dynamic allocation system to ensure that all resources can be utilized effectively. The dynamic monitoring of cloud resources support real-time monitoring of various cloud service resources and adjust the distribution of cloud services resources automatically. The cloud security management can guarantee the safety of mass cloud data in the system to support normal operation of cloud service platform for wisdom city. 4) The core of service layer is to support platform based on IaaS, PaaS and SaaS three models, and provides all types of users with all kinds of wisdom city management services including wisdom network, wisdom city management, wisdom traffic, wisdom logistic, wisdom data and so on.

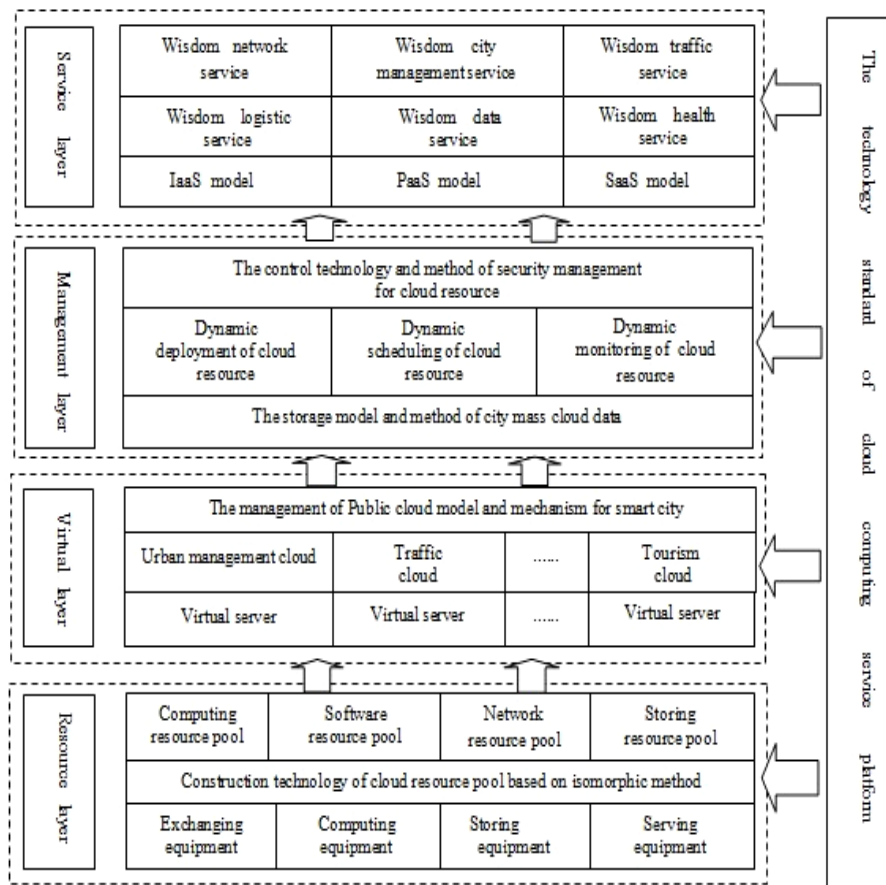


Fig. 1. The platform architecture of cloud computing service for wisdom city.

3. Key Technologies and Methods

3.1. Research on the Method of Constructing the Cloud Resource Pool

The core of cloud service platform for wisdom city management is to split massive stored data or calculated procedure into multiple smaller data or subroutine with lower coupling through virtualized technology automatically, and then delivers these data or subroutine to a huge "Cloud System of City Management" which insists of multiple servers to schedule collaboratively and do parallel distributed computing. Virtualized technology is designed to be isomorphic processing among various types of cloud services resources, and construct the cloud resource pool which supported by cloud service platform system of wisdom city management. The cloud resource pool has the characteristic of resource sharing, demand assignment, dynamic extension, standard service and automatic management. When the users of wisdom city management apply to use it, the cloud service resource pool can randomly pick out cloud service resources for the current request service, and then the cloud service resource has to be recycled by the resource pool until the user finish his requirement. In the cloud services platform of wisdom city management, common types of cloud service resources pool include cloud computing

resource pool, cloud storing resource pool, cloud application resource pool, etc. We can use the construction of cloud computing resource pool technology which based on memory compression algorithm, cloud storing resource pool construction technology which based on two-level storing virtualization technology and cloud resource pool sharing technology which support cross-regional work to construct the method of cloud resource pool mentioned above.

3.2. Research on Dynamic Scheduling Technology of Cloud Resource

There exists a large-scale of low-cost computing nodes which consist of cloud services platform for wisdom city management. On one hand, these nodes limited by computing, storing and broadband capability, which need to seek good computing resource scheduling strategy to shorten the time to find a suitable virtual machine resource for users' task, and speed up the uses' task assigned to the suitable virtual machine to ensure that the users' work could be finished on time. On the other hand, the scale of cloud computing for wisdom city tends to be very large at a specific time, while different from the exclusive resource allocation mode in the network, all the resources from cloud service system of

wisdom city will be shared by all users simultaneously. It means that the users' task in the cloud service system of wisdom city will be divided into process or even granularity level, and thus needs a more efficient strategy for cloud resource allocation or scheduling [6]. In addition, the cloud service system network environment and cloud resource spatial distribution of wisdom city are often in an unpredictable state. Based on this condition, we can use the ant colony to optimize algorithm and find out the computing resources in the unknown network topology, and use relevant operation of pheromone, backward and forward ant to choose the most suitable one or several to allocate them to user, until it can meet users' requirement [7].

3.3. Research on Dynamic Monitoring Technology of Cloud Resource

In the cloud service system of wisdom city, all kinds of cloud resources have used virtualized technology, and most of the resource characteristics are hidden, but the cloud service system of wisdom city also need user's information demand such as processor speed and memory size to help the users find out the suitable cloud service resources. At the same time, it needs the system to support the monitoring of the stated information of cloud resource to solve the fault of a certain node in cloud system. The data we get from the cloud resource monitoring can be used for the discovery and distribution, task scheduling and load balancing of cloud service resource. Based on this condition, the cloud services platform for wisdom city management requires two models to support cloud resource monitoring, the active mode refers to the resource monitoring component nodes in cloud service platform and the stated information of virtual machine from the virtual machine monitor acquisition itself and the running virtual machines, then transmits its own monitoring information to the master node automatically; while, the passive mode refers to the master node sends requests to nodes in the cloud services platform, then the nodes turn the monitoring data back to the master node [10]. Through the graphical user interface from master node monitoring system, all the nodes of the static and dynamic monitoring information can be viewed by cloud services platform of wisdom city management, meanwhile, it can set up some important objects to be monitored by setting threshold, and the threshold setting passed the threshold to the collector of nodes through interactive components.

3.4. Research on Control Technology of Cloud Security Management

The cloud service platform of wisdom city management can be managed and controlled from the following four aspects including the design of

security operation procedure, the security strategy and method, the authentication protocol model of cloud security based on wisdom city management and the encryption of cloud security which can be searchable. Among them, 1) The authentication protocol model of cloud security based on wisdom city management which includes users' registration and mutual authentication between user and access public cloud. In registration stage, users interact with the private cloud to generate the proxy signature key; in mutual authentication phase, users first sent an authentication request to access public cloud to see weather users are legal or not, if it is legal, then answer the authentication information to users to invest its legitimacy. 2) The cryptographic technology of cloud security which is searchable can search the encrypted ciphertext directly, then chose ciphertext directly according to the users' requirements and returned it back to the corresponding users. In this process, it can not reveal any index or file information to cloud service providers [8]. Its architecture includes three core modules: data processor -- handling data before transmit it to the cloud; data validator -- checking the integrity of data at any time; token generator -- generating token which allows service providers to get documents.

3.5. The Technology Standards of Cloud Computing Services Platform

The cloud services platform for wisdom city management only based on strict specifications that can make a number of computing entities into a perfect system which has powerful computing capacity and with the help of infrastructure and service (IaaS), platform and service (PaaS), software and service (SaaS) and other advanced mode to distribute powerful computing capacity to the terminal users. The standard system of cloud service for wisdom city management includes: 1) Standard frame: it involves standard directory system scale, system terms and project construction management approach of cloud computing service platform for wisdom city; 2) The standards of infrastructure management: it includes four aspects of specifications contains data storing, service computing, resource management and system monitoring, and also define a logical model to manage the resource in the infrastructure which is so called service field; 3) The standards of information management: it includes all types of information management standard of cloud platform for wisdom city, such as city management information, users' information, security information, etc; 4) The standards of service management: it includes all specifications related to the service that provided by cloud computing service platform; 5) The standards of demonstration application: it includes parking, regulation and public security in city, etc; 6) The standards of operation and maintenance: it includes

four aspects of specification contains the evaluation of information resources, the management of system operation, the management of system maintenance and the security management; 7) The other standards: it includes other specification which related to the construction and operation of wisdom city [9].

4. Conclusion and Prospect

This paper presents the cloud service platform for wisdom city management, meanwhile, it has been initially applied in the wisdom city management system which taken by one certain Zhejiang Technology Group Co., Ltd. This platform can effectively integrate, dynamic deploy, schedule and monitor the cloud service resource, and allocate the cloud computing power and stored resources according to the application requirements to realize the efficiency optimization of wisdom city management. The research shows that with the help of the virtual infrastructure of cloud computing platform, it can effectively support the wisdom city management system to achieve a unified and high efficiency platform layer and support primary software and hardware management on a large scale in wisdom city system, and also support the wisdom city management system to realize the optimization of business or resource scheduling management to reduce the cost of wisdom city management effectively.

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2

Sergey Y. Yurish

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