

Design of Mobile Internet Cloud Platform Software Application Platform

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Abstract

Mobile Internet cloud computing has the features which convenient access, covering a wide range, however, due to the large number of the application service, the design of the software become difficult, aiming at this problem, the paper develops a software application platform which decoupling of data and service, it effectively solves the difficulties of development problems and scalability of the platform. And it gives its concrete realization process, which provides a useful exploration for the realization of the mobile Internet cloud platform.

Keywords: *Mobile Internet, Cloud Computing, Application Platform, Scalability, Implementation Process*

1. Introduction

Now the thought of "ubiquitous network, omnipotent business", which the mobile Internet is one of the hot topics in the field of communication technology. It changes the people's behavior and attitude of life. And with the rapid development of mobile Internet technology, especially mobile terminal equipment to update the speed of updating and 4G network promotion speed, and the number of mobile Internet user terminal growing people on mobile Internet quality of service (QoS) requirements become more and more strong, so here by mobile terminal of mobile Internet service quality and user behavior for the future mobile Internet development and research has important significance. At the same time, the fusion of multi touch technology, retina, multi-core processor design and Android and IOS smartphone operating system software and hardware technology, which makes in our life that can only be called SMS messages in the mobile terminal to create a communication, entertainment, financial, health, query to one of the mobile intelligent terminal equipment, and move the development of the Internet makes people carry on intelligent terminal equipment can access the Internet anytime, anywhere access to information and services. According to data released by the International Telecommunication Union 2013 annual report shows the global mobile market in 2013 has achieved great development, of which the number of global mobile networking equipment reached 6.8 billion units [1-3], which is on the global each of the hands have a mobile device. And the total number of Internet users in the world using the Internet and mobile Internet has reached 2.7 billion people. But although like the international telecommunication union organizations and governments in the promotion of fixed line internet invested a huge sum of money, many private enterprises also a positive increase in developing country telephone density, but solid line telephone service users still in reducing, the solid line telephone penetration approximate per hundred households families have 16.5 users. In particular, now the promotion of 4G networks, mobile terminal equipment access to the network's speed and network quality of a large margin to improve the wave of the Internet reform pushed to a new peak. Mobile terminals become the first entrance of the Internet, the application penetration. According to the China Internet Network Information Center report, in the past the end of June 2013 scale of the

number of Internet users in China reached 600 million, compared to 2012, the number of users increases nearly 27 million people and popularity of the Internet rate from 42% improvement to 44.1%. At the same time, the data show that China's mobile terminal access network has reached 460 million users, the use of mobile Internet users in the use of mobile Internet continues to rise. At the same time through the desktop computer Internet users continued to decline. In the past 2013, the proportion of Internet users through the PC devices in China continues to decline, the proportion of users accessing the Internet through the mobile terminal continues to maintain a growth trend. Finally from the above data we can get the mobile terminal equipment share and development speed has exceeded the PC device. Individual end users may have pad, mobile phones, Kindle and other mobile devices to access the Internet at the same time, mobile terminal development will inevitably lead to information generated in the mobile terminal is becoming more and more diversified, the manifestation of the information may be mail, text information, video information, data may be the structure may also be non-structure. In general, the data of the mobile terminal not only has the diversity, but also the data quantity is very big. In the above description, it can be seen that the research on the service quality and user behavior of the mobile Internet has a profound significance and influence [4-6]. Now the major Internet companies is to in the big wave of mobile Internet to occupy the market access to users have launched a variety of mobile Internet services such as social services, health services, navigation services, financial services *etc.*. In this intense mobile Internet, the development of competition wave which the stronger, the strong and the weaker, the weak. How to improve the quality of service, and understand the user is the key factor which it can survive in the era of mobile Internet greater development. The Internet giants in order to establish the ecosystem of mobile Internet, and set up a variety of mobile Internet platform, such as Baidu to develop open cloud platform provides application engine (BAE), cloud storage, cloud database, cloud push, media cloud, LBS (based on location service) cloud of cloud services. As well as the establishment of time relatively early in the first Ali cloud platform to create a data sharing of and Tencent QQ through the large circle of users and social networking applications "micro" create a set payment, mobile games, sharing, social networking and other ecosystem [7-9]. And these can be built a complete cloud services Internet giants, some other companies according to their own advantage put forward more specific cloud services such as push service, data for analysis services, said the quality of mobile Internet services directly determines the user experience. Many of the problems currently encountered is our of our service not a whole multiple dimensions of quality analysis of user behavior understanding enough, these data to optimize upgrade service quality has a very important reference value. Analysis of the quality of service (QoS) help us on the network operation and network data, which can better establish server network access services, and improve the quality and speed of users access services. At the same time, it can help to find out all the information of the mobile terminal when the problem is not determined. Improving the quality of mobile Internet service we need to mobile internet terminal user behavior data processing deeper analysis of user behavior data to observe users' interests, to understand the focus of interest to the user, the discovery of improve the user experience effect of current services provided to users, while maintaining the existing user base to find more potential users. Therefore, the research on the behavior of the mobile Internet has important significance for the development of the mobile Internet, and provides the high quality service for the end users. With the development of wireless communication, especially the development of cellular mobile technology, the fifth generation mobile communication system will be in 2020, so mobile devices, especially mobile phones, tablet PCs, *etc.* This allows people to access the Internet through mobile terminals anytime and anywhere, thus changing the way of people live. Therefore, this paper studies the problem, and the application of the cloud platform design has great theoretical and practical significance.

As shown in Figure1, the topology of the mobile Internet, the mobile Internet from the overall structure of the mobile terminal, mobile Internet and information processing platform. Among them, the mobile terminal and mobile Internet provides the hardware for the information processing platform, and the information processing platform provides users with a variety of services.

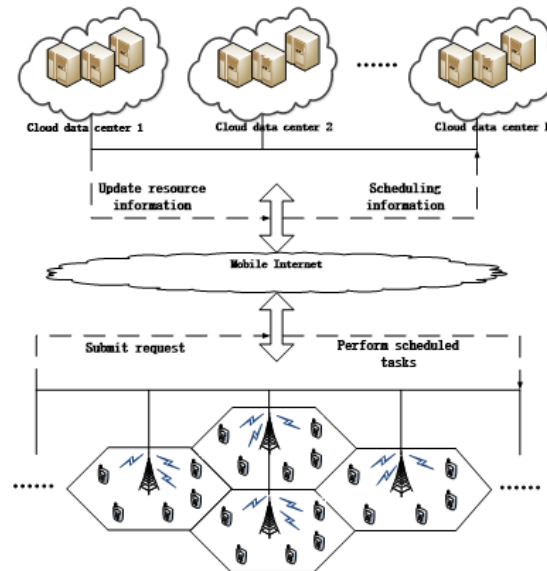


Figure 1. Mobile Internet Topology Map

2. Related Works

2.1. Mobile Internet Research Status

Research of mobile Internet service quality has been the subject of academic circles and enterprise circles focus, especially the rapid development of the domestic in recent years, the mobile communication technology, network access of constantly updating and upgrading from the previous analog signal to digital signal, from the first generation of AMPS, TACs to 2G, 2.5G network to 3G network based on CDMA and TD-CDMA. In the last year China started publishing the 4G LTE network, network operators have telecommunications, mobile, Unicom. Mobile Internet access network is more complex, which directly affects the development of mobile Internet, and also make analysis on service quality of work and increase the difficulty. Secondly, mobile terminal equipment brand differentiation is more and more serious, at the software level, and now the market is mainly popular is Android and IOS, because of its open source Android operating system, the terminal equipment manufacturers according to their own needs modification mobile phone operating system, resulting in mobile Internet a lot of incompatible phenomenon. And the inconsistency of data is also a great obstacle for the analysis of the quality of the mobile Internet. Influenced by the traditional Internet model, now a lot of research on the quality of mobile Internet service is still in the traffic statistics. But because of the characteristics of the mobile Internet, which is "anytime and anywhere ". Only from the network traffic to analyze quality has been difficult to fully understand the current service quality, but now more and more hope to get the user terminal equipment access service in detail. Simply relying on previous data acquisition methods have been unable to meet the requirements of the enterprise data.

As the mobile Internet is a new type which develops from combined with the mobile communication technology and the Internet, although the development of it is fast, but scholars at home and abroad research on this field is not enough thorough, especially in the field of the user behavior and service quality research. To improve service quality is a must, at the same time, it is necessary to analyze and study the user's needs. Now in the early stages of the rapid development of mobile Internet, hundreds and thousands of terminal applications appear in the major application store every day. But now the people of mobile Internet user behavior of the importance of understanding is not much, especially in domestic scholars and enterprise of mobile Internet user behavior analysis and research is still in the exploratory stage, the main reason is to mobile Internet monitoring and collection of data is not accurate enough comprehensive reasons of mobile Internet user behavior on the data knowledge foundation is very weak. Most of the research work for the predecessor of the mobile Internet GPRS network, which also has a lot of scholars is very interested in the WAP network and carried out research on it. In the early years, scholars at home and abroad has on the mobile terminal access network were studied, in the foreign research of the mobile terminal access network has made some achievements which Tamas through long-term observation and measurement data proposed a suitable for GPRS network user behavior analysis flow model, in this traffic model found in the GPRS network session arrival time follows a Poisson distribution. WAP network traffic model which is proposed by Irene *et al.*, which built based on different users. In this model, the characteristics of WAP traffic are analyzed. In the end, they put forward the conclusion that the WAP flow has not the character of self-similar [10-11].

Openness as one of the important characteristics of the service itself, open service has become an important part of service computing. In order to realize the convenience of the service system and the application of the development and the distributed operation, break the technical bottleneck of the underlying network environment, API (Application Programming Interface) came into being. API technology through the function and interface of the form, achieving interoperability between the system, and allows developers to pay no attention to the underlying implementation details. With the individual user's requirements and service capabilities on the diversification, business platform for the isolation of the deepening, more and more service system is encapsulated into the computer can identify the business interface in the form of open, available to the majority of the third party developers. This behavior is the open API, while providing the ability of open API system/platform is known as the open platform. Development platform mainly in the form of Open API provide external access to web resources and data services interaction, which makes the third party open to Open API developed rich applications/systems based on, and open platform also provides dynamic deployment environment and resources monitoring ability.

In the mobile Internet era, open service is the inevitable trend of mobile Internet to solve its own bottleneck, to create a harmonious industrial ecology, to achieve rapid development. [10] points out that the mobile Internet is the Internet and service of the access network in the mobile Internet, which includes three elements, such as the mobile terminal, the mobile network and the application service. Literature [11] proposes that the mobile Internet is the product of integration of mobile network and Internet, which is in the existing based mobile networks and Internet, for mobile users to provide service in Internet and mobile Internet business, for the Internet to provide mobile access methods, it can provide for the user is more mobile, more in-depth to people's production and life, safe and controllable network and service system. The [12] pointed out that the four main characteristics of mobile Internet services through deep study: (1) integration, mobile Internet combines the mobile communication and the traditional Internet, at the same time, fusion of service is reflected in many aspects of terminal technology, business ability, basic resources, (2) personalization, mobile terminal as a private user terminal, which can

more effectively reflect the individual needs of users, (3) the portability of mobile Internet services, users can at anytime and anywhere access and use Internet services, (4) openness, mobile Internet service capacity needs to open out a standard form, which can be applied to different terminal, delivery at the same time also facilitate integration and multi service ability. Thus, openness is one of the important characteristics of mobile Internet services, and it is widely used. Thus, the mobile Internet not only gives the service to the new characteristics of the "open", and "open service" has become the main part of the mobile internet. On the one hand, the mobile Internet based business has accumulated a certain amount of resources and users, it can attract more third party developers involved in the development, application of open service to make, to maintain a benign interaction relationship between third party developers and mobile users, open platform, promote the service system more open its service ability, on the other hand, open service expands the storage and computing power of the mobile terminal itself, making the mobile application/system without the need to purchase a large number of hardware resources can enjoy massive storage resources, without dynamic deployment and self-maintenance operation monitoring system can be achieved, but also no longer depends on the specific terminal, you can achieve data access and business processing whenever and wherever possible.

2.2. Cloud Platform Data Framework

The proposition of cloud computing and the promotion of tourism commercialization promotes the information, intelligentization and customized of tourism. So gradually in 2010 put forward the concept of "cloud computing", cloud computing promotes the development of calculation data, but it is based on the framework of traditional Internet, the data real-time and business diversity cannot be better than mobile Internet. Cloud computing needs to be extended to various fields, which is very important in the application of tourism. The current cloud computing mainly presented in an IAAs, PAAS and SaaS service model, and with related all XaaS (X represents at least more than 3) model to define. At the same time, in order to define the application model of cloud computing, cloud computing is usually divided into public cloud, private cloud and hybrid cloud, *etc.* According to International Data Corporation statistics show that cloud computing, in just a few years, has been applied in various fields, and has a huge economic value. Currently, the famous cloud computing platforms such as Google Apps engine, Amazon EC2, Microsoft Office live, Netsuite Suiteflex, IBM blue cloud, *etc.*, and a cloud of specialized areas of application: cloud manufacturing, cloud simulation platform, grid cloud platform, scientific and efficient cloud computing, based on cloud computing education platform. In academic circles also launched a rich study on cloud computing, the clouds trust/security research, cloud environment resource assessment modeling and simulation, cloud computing quality and cloud service architecture composition. In the literature [7], the cloud computing concept and platform for analysis and overview summary, from the point of view of concept and platform to clarify the what is cloud computing, and in the [8], the authors review the cloud computing architecture and key technology, and the latest research progress of the cloud computing, and in [9], the author comprehensively outlines the cloud computing principles and the research status. On the tourism cloud, which can be based on the IaaS framework, we can get the distribution of the tourism resources, the group characteristics of the tourism users and their data analysis and calculation functions as well as the configuration function. Which constitutes the entire tourism cloud infrastructure, in the PaaS framework, which can extend fundamental IaaS framework, the adaptation ability and application ability significantly are expanded, all kinds of application platform can be constructed on the basis of it. Based on two fundamental frameworks, which can build a SaaS framework that can further optimize the business system, this system can according to different needs, different data structure, so as to get the efficient and accurate customized software.

Through cloud computing theory and technology, and based Internet distributed computing model to construct tourism informatization frame structure that meet tourism needs of the parties, and in the construction of tourism cloud platform, according to the needs of the parties for dynamic deployment, configuration and reconfiguration and cancel the service of new tourism informatization mode, at the same time, which can also satisfy the cloud is calculated according to the required high reusability, scalability computing, load balancing and can be rented properties. And application virtualization, platform virtualization and desktop virtualization should also include travel all resource virtualization implementations, and the virtualization of the tourism resources is safe and reliable to be used and reused; usually virtualized resources can include the server virtualization and virtual memory is proposed. 1) Server Virtualization: it is the one or a plurality of physical server virtual into several complete and reliable server for the different needs to use, it is base of IaaS, for the different needs to provide use/rented server support. 2) Memory virtualization: it is consolidated and integrated management of the tourism of the cloud system storage resources, so as to different user needs to provide a unified, independent of storage space, and a unified optimization, collaborative management of the whole tourism cloud storage data, 3) Application virtualization: it abstract from tourism cloud by cloud (different user groups). The application of the underlying system and hardware dependent, form an independent and integrated application, so as to relieve the coupling relationship between the applications and the operating system and hardware. In China, in view of the current market a variety of channels of data source analysis, only a very small part of the research and consulting company adopts the questionnaire research, collection and a desktop study of mobile Internet users using behavioral data, but obtained through such channels according to often in general there is a lack of continuity, collect cycles of data for very long, get questionnaire geographical factors influence is quite big, poor accuracy, resulting in ultimate reality as desktop research data source effect is not ideal. At the same time, although through part of the smartphone App distribution channels and platforms to download can also get some App downloads, App uses statistical data analysis, but because of the existence of the IOS App store data is not open to the public, the Android market platform in China and many download branch channel and feedback effect will exist very big, it is difficult to see the comprehensive, high consistency of comprehensive real data. At the same time, through in-depth analysis found, smartphone users from downloading the App to the actual installation, the activation and using this app process, user loss rate still has very high proportion, so simply rely on downloads to judge the user's actual behavior, and the derivation actual mobile Internet users use behavior trend is bound to the existence of so many serious problems, deviation is large, it is difficult to obtain final true and objective data. It is based on the characteristics of mobile Internet, the demand for the library management, this paper developed a cloud computing management platform. Next we will for cloud platform computing resource allocation and software development of forecast data.

3. Proposed Scheme

This paper developed a cloud platform management operation service system based on mobile Internet, the system faces on mobile Internet open service architecture, further open the bottom capability, response rapidly to customer demand, effectively reduce the open their threshold of one of the important technical means, and promote the rapid development of the business model of the mobile Internet services "long tail" and change the focus on the status of mainstream business development. By reducing the development of new services and operating costs, and shorten the time of the new service, which meet the needs of the "niche market". However, for the traditional mobile phone

application design, this article will not repeat them, so only on the server side of mobile Internet software development of detailed elaboration.

3.1. Software Implementation Based on Data Computing Resource Allocation

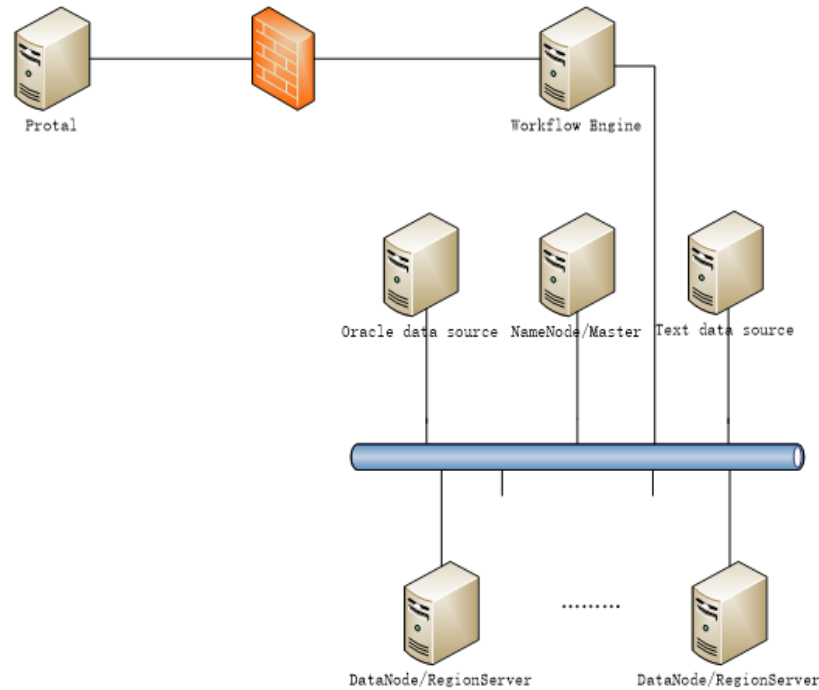


Figure 2. System Topology

From architecture can be seen in the cloud platform library intelligent management system is composed by 6 layers and two service modules, which 6 layers respectively as the data source, data integration, data storage, data analysis processing, display of information and business applications, two service modules for the entire system to provide security services and access control service.

The data layer provides basic data services, which cloud database also provide distributed computing services.

Component layer provides five kinds of service components, including: data interface module, acquisition for the three data sources (Oracle, HBase and text) interface description service, process designer to provide data source metadata information, data ETL components provide for the three data sources of data import function, the data lead to the cloud data. Data Join component provides the two HBase tables in accordance with a fixed field join operation, the result set into the new HBase table function. Data preprocessing module can process the data preprocessing algorithm in HBase to meet the need of data mining algorithm. The component includes six sub components, each subcomponent achieves a preprocessing algorithm, and these subcomponents are: missing value processing components, duplicate removal components, data sampling module, normalized components, attribute selection components, properties deleted components. Data mining algorithm component is mainly provide parallel processing of data mining algorithm, reach for parallel data mining in the distributed database, including prediction, clustering, classification, association analysis, outlier analysis and outlier analysis algorithm for parallel implementation.

Service layer includes a workflow engine and system management services, which workflow engine include: process design service, it provides services for the foreground process designer, including create workflow, workflow editing, deleting workflow and

workflow verification, scheduling management is key to manage the execution of the workflow, which is responsible for automatic or accept business personnel command manually workflow instance, monitor the operation state of the process instance, stopping process instance, log management can manage all kinds of logs that be generated in the workflow, management personnel through the module can understand the workflow engine and various characters in the process of work. System management services include: resource management, the workflow designer using the data connection management and verification, authority management is mainly responsible for authority division of resources and processes, in view of the different role to realize different resource use, process customization and implementation capacity.

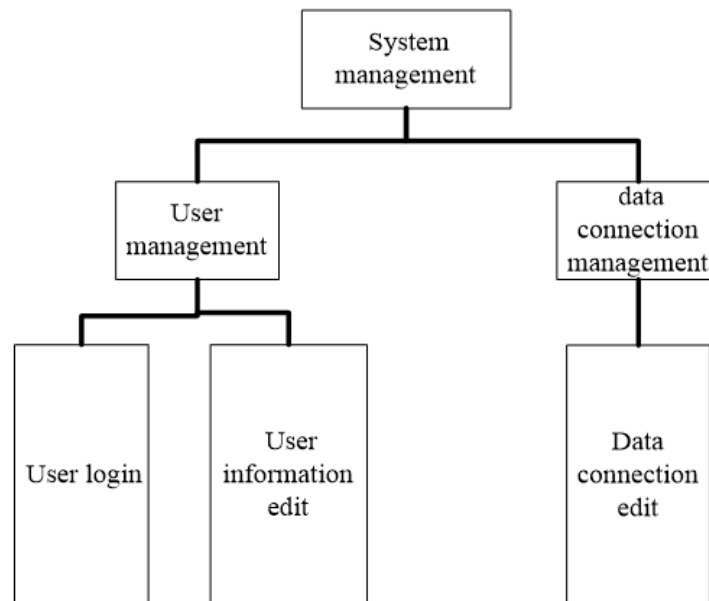


Figure 3. System Management Logic Structure Diagram

According to the needs of users, "workflow editor" combines different components, forming a complete business data processing procedure, known as the "workflow". 4 major categories of components which are provided by system: ETL components, data JOIN components, data preprocessing components, data mining algorithm components.

Data ETL components achieve different data source data to platform ETL operation. The ETL module contains three sub components: the Oracle oriented component of the ETL, the ETL HBase oriented component, and the ETL the text data oriented component. The conversion type of data: no conversion, the front-end/back-end of data fill zero, taking the substring of string, string concatenation of four kinds of transformation rules and any combination of these rules, for each field can specify the transformation rules. The whole ETL process should have the characteristics of parallel and incremental, which can configure the number of map and reduce, and can specify the key field of incremental ETL. In addition, the ETL module implements the three types of data exception handling mechanism, the discarded, the output log, the stopping running.

Data JOIN component implements two HBase tables in accordance with the fixed field join operation, the result set write in a new HBase table. Data preprocessing module is used to process the data in HBase, so as to meet the needs of data mining algorithm. The component includes six sub components, each sub component achieve a preprocessing algorithm, these subcomponents are: missing value processing components, duplicate removal components, data sampling module, normalized components, properties selection components, properties deletion components.

Data mining algorithm component to realize the five types, 11 data mining algorithms, and formed 11 sub components, the prediction algorithm achieve three, clustering algorithm achieve 2, classification algorithm achieve 2, association analysis algorithm achieve 2, outlier analysis algorithm achieve 2. Mining algorithm should implement parallelization, which can configure the number of map and reduce. Mining algorithm can process numerical data types, but also including the date, week, month, quarter, such as the definition of the type of data to define a specific processing method.

According to the specific business needs, users can choose different components to complete the data processing workflow to achieve the purpose of obtaining knowledge from the data.

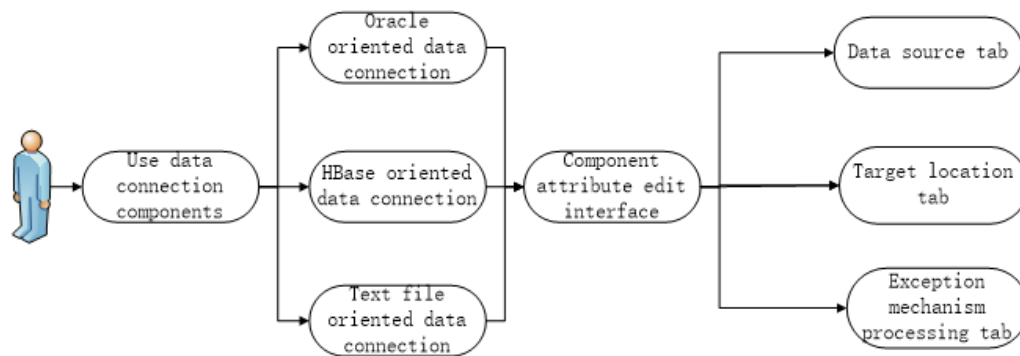


Figure 4. Data Structure

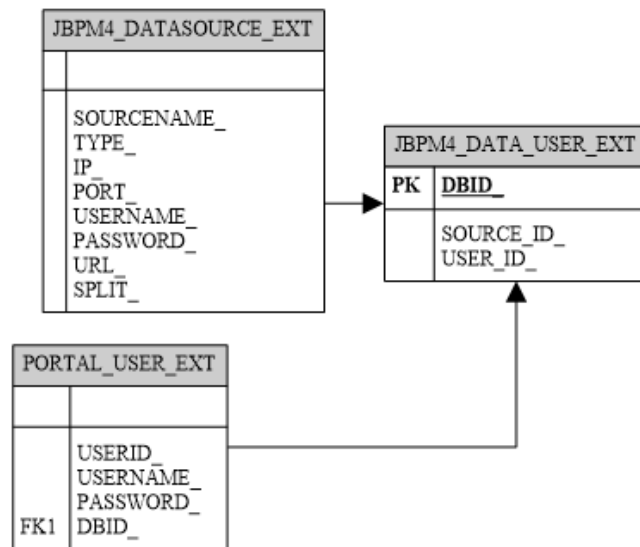


Figure 5. Data Connection Components Case Diagram

Users using the data connection component tab to select the necessary choice of operation, which has Oracle oriented data connection, HBase oriented data connection, text file oriented data connection and going into data source tab, and selecting the location of the data source, target data placement and exception handling.

3.2. Data Join Components

Data join components include the data connection between the tables, the case can be expressed as shown in Figure6.

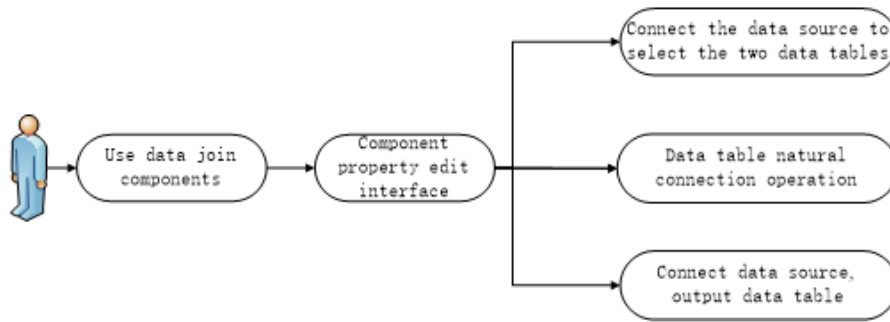


Figure 6. Data Join Components Case Diagram

The function of data Join component is to merge two Hbase data tables into a Hbase data table, and the key fields of merge is equal to natural connection in the database. This component achieve a complete function, which can be seen as a case in overall, the concrete can be divided into three cases, which are respectively connected data source selection of two data source table case, on the data sheet for natural join operation cases and to connect to the data source. The output is the number the case table.

1. The Module Describes

In actual production applications, the data we need is often not from a single data table in the database, but from different tables in the database. The traditional relational database, such as Oracle, which multiple table join operation to provide better support and user provided by the use of SQL and database interface can easily achieve multiple table connection operation and query. But in HBase, each table is according to the column store and HBase did not provide data table connection operation, using in the practical application of the HBase must design and implementation of HBase data tables in a join operation, it also is the data join components. Because to deal with large data, data Join components to be distributed in parallel processing, the data table contains a lot of data to carry out efficient connection operation.

2. Functions

In Hadoop and HBase starting, from HBase choose two tables, by invoking command-line parameters to read configuration files from two tables in the header information and generate new table header information, running after the integration of the new table and saving in HBase.

3. Process Logic

Data Join component merged the two Hbase in the data table into a data table, the combined key fields such as sub_id, which equal to the database of natural connection operation.

The main design idea: the stitching of two tables through comparing the key words of two tables, jointing the same record of the key words, forming a new table. So considering the key words in the two tables as key, and the rest of the field as value, so that the reduce can be two tables with the same key value of the record to some rules of stitching. However, due to the inability to distinguish a record sources come from Table 1

or Table 2, so before the data integration, first through the map/reduce respectively records of two tables by adding symbols to indicate the source in the table which in the mosaic.

Detailed parallel ideas:

- 1.The first phase map: through the map to preprocess data of the two tables: the data of first table indicate flag1, the second table marked Flag2. At the same time, the key of two tables are moved to the first column of data.
- 2.The first stage reduce: the data contents of the two through the preprocessed tables are written to the temporary file by reduce.
- 3.The second stage map: the data in the temporary file is processed by map. The key is entered in map.
- 4.Default - the offset of each row of data, value is the text of the row of data.
- 5.The second stage reduce: one or two records of the same key are made in accordance with the rules of natural connection or left join, and deleting the adding flag of first phase and writing the result to the new data table.

4. Experiment Results and Analysis

As the calculation and simulation of the cloud computing model is the mobile Internet. Therefore, it is necessary to build a cloud simulation platform, the cloud model platform using cloud computing simulation general platform CloudSim and develop based on the distributed parallel calculation and by means of the platform can use the resources of the computer simulation data storage and transmission, but it lack of topological changes of the link, according to the actual situation, this experiment has been modified. This modification based on the topology graph to change the data and time of transmission. Simulation environment include computer configuration environment. Its computer simulation environment is shown in Table 1.

Table 1. VM Configuration

	CPU	Memory	Hard Disk
VM_1	1 × 2 GHz	4 GHz	500 GB
VM_2	2 × 2 GHz	8 GHz	1 TB
VM_3	4 × 2 GHz	16 GHz	2 TB
VM_4	8 × 2 GHz	32 GHz	4 TB

The simulation journey is as shown in the figure below, according to virtual task and scheduling to achieve the model, the core algorithm is written for the development, the scheduling interval based on the different simulation environment, which need to be set up separately.

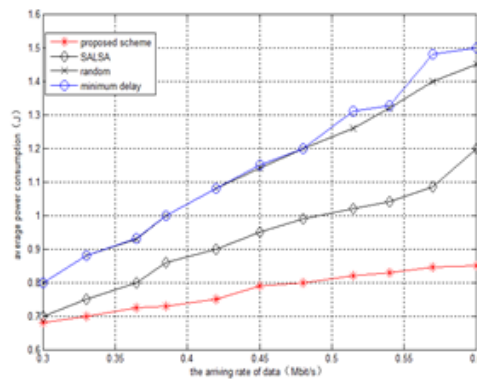


Figure 7. The Average Power Consumption

Figure 7 the average power consumption, we can see that the average power consumption of proposed algorithm was significantly higher than that of the other schemes, it can be seen that proposed scheme have strong ability of calculation in business, which is more suitable for mobile Internet cloud computing solutions, because the energy of mobile internet terminal is limited, the platform can save energy, and its computing ability is relatively strong.

5. Conclusion

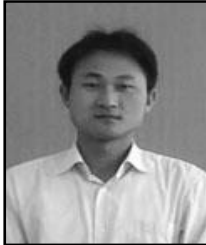
According to the characteristics of mobile Internet, this paper construct the mobile Internet cloud computing cloud software platform, for the allocation of the computing resources, this used optimized energy efficiency scheme, and taking into account business dealing, through the experimental simulation platform, we can see the resource utilization rate has been greatly improved, at the same time, the platform adopts open type design, which can integrate the more business, so it can take advantages of mobile Internet cloud computing.

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