

Trippster: An Application For Tourism Based on Data Stored In Cloud

Shuang Liu*, Dong-Ding Ling* and Dong-Ye Huang*

*School of Mobile Information Engineering

Sun Yat-sen University, Zhuhai, P. R. China, 519082

Email: liush48@mail2.sysu.edu.cn, lindd5@mail2.sysu.edu.cn, huangdy7@mail2.sysu.edu.cn

Abstract—Travelling in leisure time gains increasing popularity among individuals and becoming the necessary part in new year schedule of individuals as the development of finance and living conditions. Therefore, a more convenient and feasible way is required to serve travellers. However, traditional websites cannot guarantee the instant information update, the pertinence and the portability, causing users have a hard time searching for the information they need. In order to solve these issues, several travelling applications run in mobile devices are developed to allow users to search for tourism information. Nonetheless, owing to the fact that most of the data is stored in the local end, neither the security of data nor the ability to store a large scale of data cannot be ensured. Under this circumstance, we propose an application, named Trippster, which is based on data stored in the cloud to provide individuals a stable, feasible and personalized platform to allow users search for related information and recommend the strategies they might favor. By using cloud computing, the server in the cloud can store and handle with a large scale of data, with the data transmission between the local client sending the requests and the remote server returning the results. In this paper, information for tourism is collected through the mobile device that constantly sends the requests to the server with the data, and the immediate response is ensured by the feature of running twenty four hours a day with low cost, taking advantage of the characteristics of the cloud platform.

Index Terms—Trip; Cloud Platform; Application

I. INTRODUCTION

Along with the improvement of individuals' living conditions, a trip plan is becoming the necessary part in individual's leisure time. Traditionally, people often search the information they need by scanning a variety of websites on their personal computers. Nevertheless, the traditional method is equipped with the following drawbacks. Firstly, the information on numerous websites is hysteresis, owing to the reason that fewer people incline to share their experience with others through the computers, along with the increasing popularity of mobile devices nowadays. Secondly, the contents from the various websites are not of pertinence, which makes it harder and time-consuming for users to find the information that is suitable for their conditions. Correspondingly, the passion is attenuated and the efficiency of preparation is greatly decreased. Thirdly, the heavy weight of computers, compared to the mobile devices, makes it arduous to accomplish the portability. Users cannot get access to the internet immediately at any time they have the necessity to use it. These days, a few applications have emerged in order to solve the issues

mentioned above. However, none of them has found a way to make it perfectly. The lack of portability and pertinence still persists because of the overwhelming functions and the possibility of data loss.

Clouding Computing has gained a number of attentions due to its rapid development in industrial and academic fields recently. Cloud providers can offer their service in terms of IaaS, Paas, Saas based on the framework of cloud computing. In recent year, cloud computing has acted as a vital network application model in the globe because of the advantages of high reliability, rapid deployment and on-demand service. To be more specific, there are some main merits of cloud computing which are stated as followed. Firstly, cloud computing is of efficiency. As a brand new commercial computing model, it inherits the features of distributed computing. In fact, it combines varieties of distributed resources so that the softwares and hardwares can be integrated as dynamic resources. Secondly, cloud computing can handle with a large scale of data. With the fact that there are an increasing number of people who use applications, big data is becoming a common word. For an application used for travelling, there are huge amounts of information that needs storing and handling. Hence, the large storage capacity of cloud service is of great help. Moreover, in a gesture to overcome the resource constraints of mobile devices, we design a client-server framework to make the mobile devices interact with the database built in the cloud. Mobile devices can store their data in the cloud and get the data they need from the cloud.

In summary, the target of this project is to develop a platform for individuals to search for the contents about sites, traffic, food, hotel and other related information when they are in a trip. Unlike the traditional method, an application is equipped with the features of portability, pertinence and convenience. Aside from the common attributes of applications, the application based on cloud platform can store and handle with the big data and ensure the security of data. The main purpose of this application is to provide users a feasible and convenient way to find the information about their trips efficiently that is suitable to their conditions.

A. Related Work

In recent years, there have been a large amount of applications used for people's trip, among which there are three main categories.

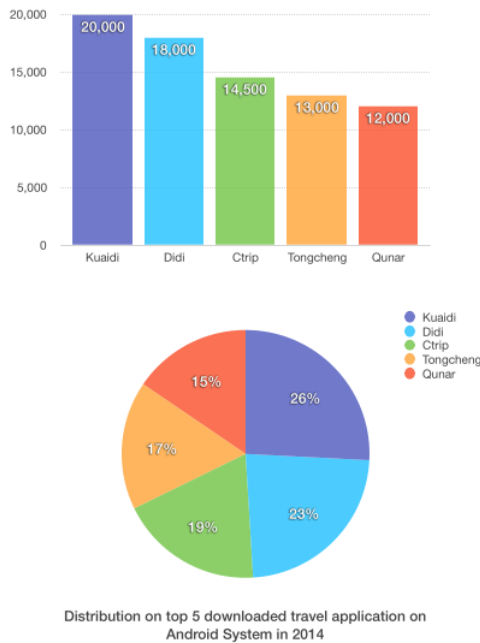


Fig. 1. Ranking of applications for tourism in China

Electricity Business: Many OTAs have already launched their own applications, through which users can purchase various products used for travelling conveniently, even get a discount sometimes. These applications offer integrated products and services. For instance, individuals are able to search for the price of the airline tickets and book the inexpensive one, get all kinds of travelling and choose the one that is the most suitable for them. Besides, there are some applications focused on a single field, like Didi[1] and Kuaidi[2]. Didi and Kuaidi provider users a time-saving way to call a taxi, which is rather popular.

Strategy Community: Some strategy community based on websites before have launched their own applications, such as QiongYou[3] and Mafeng[4]. The main characteristic of them is that the whole application has its website and acts as a community, and everyone is sharing his travel experience with any other. Moreover, there are also a number of applications originates from mobile end which gains popularity and fame. All of them focus on the sharing of strategy and personal experience, in order to let users make their own schedule.

Tools: Some applications that can only be used in a specific field is of popularity these days. Because of their profession, these applications have accumulated a large scale of users, and the purpose of them is to allow users to solve some specific issue with more professional and more efficient way. Therefore, even though the things that these applications can do is limited, they are still prevalent among individuals.

For more details we can see Fig.1 about travel application download ranking in China in 2014[5]. The kind of strategy community makes up nearly fifty percent of the total download amount, which shows that individuals are inclined to utilize the applications that can provide excellent services instead of

the ones which are possessed with extra but useless functions. Moreover, what cannot be ignored is that the category of electricity business makes up more than fifty percent of the total download amount, indicating that people are more willing to get access to integrated services with just one application that generates from familiar websites, for the reason that the number of users or the clients they accumulated is large and individuals are inclined to utilize the things they are familiar with.

In conclusion, applications for tourism have sprung up, however, from the analysis we can be aware of that they fail to accomplish the mobility of data from a mobile device to another device, in spite of the fact those applications ensure the portability and convenience. When the users change their mobile device, these websites and applications cannot store all the data of users' habits, failing to improve the user experience. We expect to design an application based cloud platform, to record all the information that plays a role in keeping the user experience even though people use the same application in different mobile devices or operating systems.

B. Our Work

To address the issues stated above, we mean to develop an application based on Aliyun[6], which is a virtual machine in the cloud, acting as a server. The users, who are clients, can get access to the database of MySQL[7] existing in the cloud, and send requests to modify the data in MySQL, such as deletion, update, query, addition. The reasons we utilize MySQL other than other database are followed. Firstly, it can handle with almost infinite number of users. Secondly, it can cope with more than fifty million records. Thirdly, the speed of executing the codes is fast, probably is the fastest at present. Fourthly, it is equipped with simple but efficient user privilege system. Fifthly, it is free, source-opened and compatible in all kinds of operating system. We utilize the Java[8] programming language to receive the requests sent from the clients in the server, and to get the corresponding data from the database into the server. Owing to the reason that the server is built in the cloud, it can run the code twenty four hours a day in a row without any risk of power failure, ensuring the advantages of low cost and that clients are allowed to use the cloud service whenever they want information of tourism through the application.

The idea of us is to develop an application named Trippster, offering a easy way to allow clients search for the information that they need for travelling. Individuals can search for the landmarks, sites, hotels, or delicious food in the neighborhood at the time they are in a location which they are not familiar with at all. Besides, in case users have the intention to visit somewhere after they get the information they need, we embed the baidu map[9] into the application to provide the navigation function so that they can be directed. Furthermore, our application will recommend the clients the suitable content based on the categories of location they are fond of. When registering an account, users will be asked to choose the types of tourism they like, including the romantic, exhilarating or

memorable one. Based on the types they choose, we will search for the related information in the remote database in the cloud and put it on the recommendation page. Besides, users can choose whether to like a passage or not, and they can trace back the passages they like in the favorites column.

In order to achieve the functions described above, we need to design a framework of client and server. Our application runs on Android, which means we need to use Eclipse to develop our applications. Eclipse is a software provided by Google, which supports various programming language to develop the applications. In this project, we use Java programming language to post the request to the server and get the data from the remote database in the cloud. As for the server, it stores all the data of all users in the database and offers a instant and convenient way to interact with the client. The purpose of this application is explicit. It aims to offering users abundant but not extra functions to allow users to search for the information they are content to at anytime and anywhere, keeping the same user experience at the same time.

The content in the rest is organized as follows. We introduce the overall background of cloud computing in section 2. In section 3, we entail the basic knowledge about the proposed platform. There is our report about the final experiment result in section 4. A conclusion is stated in section 5.

II. BACKGROUND

Mobile cloud computing[10] is what we use in our application development based on cloud platform. The main service we use is the PaaS[11], which offers service to client. Also, we use the utility computing to filter the information we need. In order to accomplish the communication between the server and client, socket is necessary, which is rather useful when transmitting data.

The data transmission between the server and client is through HTTP[12], which is a protocol for packet transmission in the application layer. HTTP is proposed by scholars to let Web server send the requests information and service to the client in a gesture to satisfy their needs. A set of requests and responses is a necessary part of establishing the HTTP connection.

Java programming language[13], as a popular language, is utilized to handel with the requests sent from application while MySQL in Aliyun platform is utilized by the database system to allow the virtual machine find the specific data in the database. The virtual machine is equipped with Ubuntu system[14], and we need to pre-install MySQL, JDK and JRE in order to utilize the functions of them in support of the library called MySQLdB.

When the client sends its request to the server out of a designated port, the request well be transmitted by TCP[15] protocol in the transport layer and by HTTP protocol[16] in the application layer. When the server receives then data, it will analyze the format of data and transform it into the one it can deal with, and then return the intended data as the format of string. When transmitting data between the local end and the cloud end, we usually use the format of JSON[17] to

encapsulate the data, due to the reason that it can be used in many types of languages and is rather easy to utilize. The data with JSON format is simple to read and write, and for servers and clients, it also facilitates the process of parsing and generation.

III. THE PROPOSED PLATFORM

Our platform is based on the Ali Cloud, in which installed the Ubuntu system with MySQL database. The reasons why we use Ali cloud are as followed. Firstly, distributed feature. Every data in Ali cloud will be copied to other three cloud hosts, which means when users store their data in the Ali cloud, their data will be stored in three different places, which ensures the security of data. Secondly, the speed of visiting is fast. Compared to other cloud server in China or other countries, the speed of visiting Ali cloud is nearly the fastest. Thirdly, the price is rather low. Ali offers a special discount for students to use the Ali cloud service, which is inexpensive compared to other cloud service. Fourthly, the operating system of Ali cloud can be chosen as what we like. As a distributed system, it offers developers a convenient and efficient way to implement the functions of a remote server and maintain the system. Logically, the whole system consists of two parts, the client part and the server part. The client part is implemented using the Java programming language in the local application while the server part is implemented in the virtual machine in the cloud. For the client part, users can use the applications to deliver the requests to the server to modify the database in the server and receive data from it. In other words, users can search for the information they are intended to learn about or update the database at anytime or anywhere. At the same time, the server will execute the corresponding codes according to the specific contents in the request it received.

The highlight of our application is the recommendation system based on the location of users, which will recommend the related travelling strategies, interesting sites, delicious food, and highly-evaluated shopping mall in the neighborhood according to where the user is.

A. Get Data

An account is necessary for users to utilize the application. By inputting the username and the password, a user can log in the application. When the local end gets the input, a URL[18] of the input username will be sent to the server in the cloud, and the server will get the password stored in the cloud to check whether the client inputs the correct password or not. If the password is correct, the user is granted to the application, and the first page the users enter will be the feature page, where a number of characterized strategies are recommended to the users based on the types they are fond of, the principle of which is that the application sends a URL to the server asking to get the strategies and the server returns the result of all the updated contents stored in the database to the client. The client receives the data and parse the texts and photographs information that will be showed in the page. In the feature page, users can scan all the pictures and their

simple introductions and click on the picture which they are interested in to see more details. The principle of getting the details is the same as before.

The local end is accomplished by Eclipse[19] and Java programming language, which can get the queries from the users, decide the timeout of the connection, get the timeout settings, use URL to transmit the data, and establish the connection to the server. For the cloud end, it sends back the information the client needs in JSON format[20] after it parsing the URL and extracting the data and the information which encapsulated by the JSON format, as showed in Fig.2.

B. Update Data

One feature of this application is that it can recommend the corresponding sites or strategies based on the category that a user is fond of. Users can change the types they are fond of in the personal information page, and the contents of recommendation will change as well. After the user changes the type, the client encapsulates URL containing the information of updating the favorite types of the users and uploads it to the server. When the server get the data, it will analyze the data and update the database with the information the client provides, using triggers[21] or indexes[22]. And the contents of recommendation the server sends to the client changes by using the triggers, as showed in Fig.3.

```
//Read the JSON data from client
BufferedReader in = new BufferedReader(new InputStreamReader(client.getInputStream()));
String jsonString = in.readLine();
JSONObject jb = JSONObject.fromObject(jsonString);
//Send JSON data to client
PrintWriter out = new PrintWriter(new BufferedWriter(new OutputStreamWriter(client.getOutputStream(
))),true);
JSONObject str2 = Deal_with_data(connect.jb);
```

Fig. 2. Data transmission in JSON format of client

```
// send requests to the server
PrintWriter out = new PrintWriter( new BufferedWriter(
new OutputStreamWriter(socket.getOutputStream()),true);
out.println(nowLocation.toString());
out.flush();

// receive messages from the server
BufferedReader in = new BufferedReader(new InputStreamReader(socket.getInputStream()));
String jsonString = in.readLine();
js = new JSONObject(jsonString);
```

Fig. 3. Data transmission in JSON format of server

C. Data Storage

Nearly all the contents showed in the application come from the data stored in the server built in the cloud, which, is one of the most important functions of the system. The categories of data include pure text and pictures, and in order to allow the mobile device download the graphics directly, we install the Apache and a Web server in the server. By using the cloud platform, we can store a large amount data without much cost. There are more than ten tables created and stored in the cloud database for the usage of the application, which implemented by MySQL language. From time to time, the client sends requests to the server to capture the information it needs[23].

D. Recommendation

Our application aims to offering users a private and targeted strategies recommendation. Hence, when the user registers for an account, he will be asked to fill the information about what types of trip he is fond of, based on which our recommendation system will recommend the related and corresponding strategies. Furthermore, users are allowed to change the types they favor in the personal information page and once they do change the types, the client[23] fielding1997apache will send the update information to the server automatically and our recommendation system will refresh the related strategies accordingly.

E. Navigation

In a gesture to allow users easily find the orientation to the places they want, we embed the Baidu map into our application. Now that all the data stored in the Baidu map is also stored in the cloud, we can easily connect to the Baidu server and use the related services. Besides, by using Baidu map API, we can search for the clients using Baidu map and corresponding sites in the neighborhood as well as designate the location and render the map navigate the orientation[24].

F. Appointment

This function allows users to make their own travelling schedules and post their schedules into the application to invite others to join with them. In the Appointment page, there are four choices. The first one is appeal, which allows users create their new trip plan and share the plan with other friends. Besides, the system will recommend the plan to other individuals with the same favors or the fans that have already followed the users. The second one is cheer, which allows users scan the detailed information and content of numerous trip program and users can also join the the program. The third choice is myTour, which indicates the plans that users have created themselves. It allows users to modify or delete the plans they have made or check the degree of participation of the activity they have created. The fourth choice is personalOrder, which means that a user needs a private customization server, based on which the company providing the service of private customization will serve the client for free or with pay.

IV. EXPERIMENTS

To substantiate that our proposed functions and methods work, we prepare some data and pictures to simulate a user's provided information, in order to test the connection between the client in the local end and the server in the remote server. Obviously, we also build a database in the server to accomplish the simulation and the test.

A. Data Transmission

In this test, we prepare some data and information for tourism simulating a user's login in the application and corresponding page, to test the transmission of data between the client and the server.

There are more than ten tables, among which are six main tables[25].The consumer table consists of information of the users, which contains three categories of items, the consumer id, which is the key and identifies the user, the username, which is used to login and check the password, and the password, which is used with the username to check whether the user logins correctly.The address table stores the information of address, such as latitude and longitude, among which there are seven kinds of items, address id, which uniquely identifies the address, the latitude, which identifies the vertical distance geographically, the longitude, which indicates the horizontal distance geographically, the path, which is the file path in the cloud server, the name, of course, is the name of the address, the zan, is the number of the amount of people that liked it, and the address, which is the specific location of it.The scenic table stores the scene information, such as scene name and its ID, among which there are two types of items, the scenic id, which uniquely identifies the scene, and the scenic name, which names the scenic.The traffic table stores the information of the traffic, which is auto-incremented, among which there are five kinds of items, traffic_id, which uniquely identifies the traffic circumstance, the starting id, which is the foreign key and indicates the start point in a kind of traffic, ending id, which indicates the end point in a kind of traffic, kind, which shows what kind the traffic is in and path_line, which indicates a path between the starting point and the ending point.The restaurant table stores the information of the restaurants nearby, including the name, price and address, among which there are four kinds of items, the restaurant_id, which uniquely identifies the restaurant, the name, which is the name of the restaurant, the price, which shows the average price of the restaurant, and the address, which indicates the specific address of the restaurant.The hotel table stores the information of the hotel, including the name, price, star rank and address, among which there are five kinds of items, the hotel_id, which uniquely identifies the hotel, the name, which shows the name of the hotel, the price, which indicates the average price of the hotel, the star_rank, which indicates the ranke of the hotel, and the address, which shows the specific address of the hotel.

The functional dependencies are showed below:

1. A consumer id decides a consumer.
2. A scenic id decides a scene.
3. A scenic_kind_id decides a kind of scene.
4. An address_id decides an address. An address item has its own latitude longitude and so on.
5. A traffic id decides a mean of transportation. The means of transportation from an address to another are no single.And there are a lot of path from one to the others.
6. A restaurant id decides a restaurant.
7. A hotel id decides a hotel.

The client-server mode can be tested from following perspectives:

1. whether the data can be successfully transmitted between the client and the server.
2. whether the data stored in the database can change if the client changes its information.

3. whether the content the application recommend can change along with the change the client makes.In this test, we prepare some data and information for tourism simulating a user's login in the application and corresponding page, to test the transmission of data between the client and the server.
4. whether the trip plan a user create can be posted and shared with others successfully.

B. Results

The results of our experiments are showed below: **Test of**

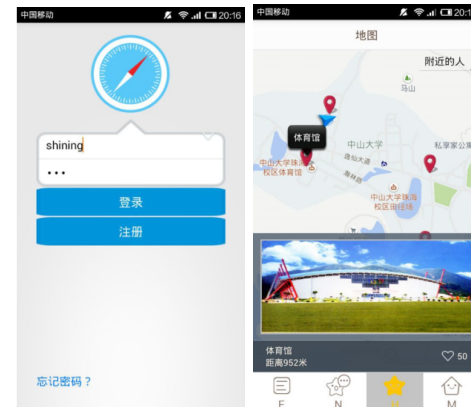


Fig. 4. Login and navigation

Login and navigation: The application users are permitted to login when both the username and password are matched.From Fig.4 we can see that when users login, they will enter the Baidu map page which shows the current location they are at, which means that the connection between the client and the server is established successfully.On the other hand, we can check and see the sites in the neighborhood on the Baidu map if we click the corresponding spot on the map, which indicates that the local end can get geographical data from the Baidu cloud server without obstacles.Every time the user changes his geographical location and relocate the position, the content on the map will alter as well.Besides, by using the Baidu map a user can get to know the people who are currently using the Baidu map as well, which is useful due to the reason that the user can get somebody to help if he loses the orientation.

Test of recommendation: Fig.5 indicates the situation where users enter the feature page, which recommends the strategies or sites with a simple introduction based on the favorite types of users.Besides, when the user wants to learn more about the information what the application recommends, he just needs to click the picture using his fingers and the next page will show the detailed strategies or information satisfying his needs.Form Fig.5 we can see that the strategies or sites and the content the application recommends is different when the user varies, which also indicates that every time the user change the categories he favors the content the local end recommends updates accordingly.

Test of Trip Plan:As Fig.6 indicates, at the time the user chooses to create a an trip plan, there are a few blanks which need the user to fill in, the name of the trip, the destination



Fig. 5. The recommendation page

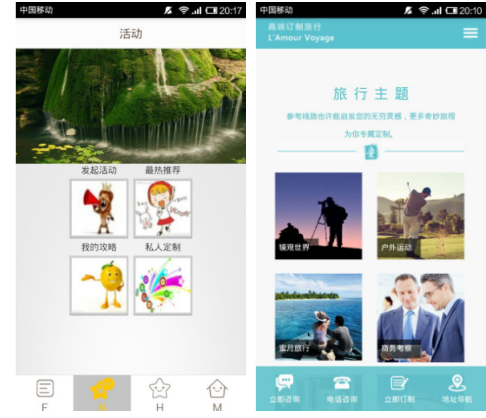


Fig. 7. The recommendation page



Fig. 6. The plan creation and share page

of the trip, the type of the trip, the time interval of the trip, the description of the trip and the budget if the trip. Once the user fills in those blanks, he can post the trip plan in the application community and share with others to find the individuals who share the same interests with him, which makes the community more like a community. Every trip plan a user creates will be saved in the database built in the cloud. Of course, the user can delete the trip plan he ever created in the local application, and this behavior will trigger the database to delete the data stored in it correspondingly.

Test of appointment: As Fig.7 indicates, in case there are users who are in need of personal customization, we add the function of appointment, using which the user can contact the companies that aims to offering clients a wonderful and deep travelling experience by choosing the types they like. There are four choices, the global travelling, the outdoor trip, the honeymoon and the business trip. When the user successfully have the personal customization for themselves, the application will record and store the specific details of their trip schedule in the cloud and will recommend related strategies in the future.

V. CONCLUSION

In this paper, what we accomplish is that we develop an application based on Android operating system using data stored in the cloud. In the server in the cloud, we install the ubuntu operating system, on which we build the MySQL database and make the host run twenty four hours a day in a row with low cost. With the database stored in the cloud, our application can handle with a large amount of data and run in the local mobile device. By using our application, users can search for the tourism information they need at any time and at any where under the condition that there is network connection. To be more specific, users are able to get to know the delicious food, inexpensive hotel, best vehicle for travelling and famous shopping mall in the neighborhood using the Baidu map and its corresponding API to get data from Baidu cloud server. Furthermore, based on the categories the users are inclined to, our application recommends the related strategies or sites in the travelling spots. When users change the categories, the recommendation content changes as well. Moreover, the security is guaranteed. Due to the reason that most of the personal information is stored in the cloud, the risk of data stealing at the local end is decreased. Besides, the portability is accomplished. The principle that cloud data storage ensure that the same user uses the same application in different mobile devices can get the same user experience. In the future, we expect to add more functions to the application. A function of sharing is expected to implement to allow users share their experience and reflection of the trip with others, to make the application equipped with feature of community. Besides, we hope to add the personal trip schedule function, by using which users can designate the places he is intended to visit, and the system will generate a best route from the current location of the user to the designated place.

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