The University of Hong Kong
Department of Computer Science

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Individual Interim report

FYP11015 -
A Secure Mobile System to Support Citizen Journalism

Student Name : LI Ka Yau, Ray
Student ID : 2009566813
Program Code : CSIS0801
Supervisor : Dr. S. M. Yiu
Co-examiner : Dr. Lucas Hui
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1. Introduction

**Background**

Nowadays, smartphone becomes one of the citizen’s necessities. The invention of iPhone increases the breath of smartphone. As more and more smartphone applications were developed and released in the market, smartphone brought lots of convenience to the users and there is an obvious trend to replace the phones. This increasing trend of smartphone usage becomes one of the famous topics in the society.

In our project, we will focus on one very important usage of smartphones which is taking photos. Today, the quality and the resolution of smartphone’s camera were comparable to a digital camera. Together with mobile internet and network, you can share your photo with friends on social network once you took it. However, as there are many steps to follow before upload to different networks, the works of sharing photos would be very painful. Sometimes, when you see some breaking news, you want to report to the news agencies. However, it usually takes so much time to report the news by phone or by email. In many cases, you will miss the most important part of the event. Moreover, your return might not be guaranteed when you provide the breaking news.

In last semester, we implemented a secured smartphone application that helps users to easily share the photos and directly send the photos to a web portal which can be accessed by some news agencies. The entire process is fast and it just needs a few clicks. The users can also read the photos and news that around them in order to understand what is happening in the near location. Moreover, the users can search photos from other users according to the photo’s categories and their locations. Nevertheless, with a secure transaction platform that will be developed in the next semester, we will guarantee the users receiving their returns when a news agency buys his/her photos.
Overview of application

A. Windows Phone 7 Application

We have implemented a Windows Phone 7 Application with variety of functions. They are Snap function, Map function, Upload/Download Photo function, Photo Tagging function and a Photo Album. The user interface showing the main page of our application is shown in Figure001.

With Snap, Upload Photo and Photo Tagging function, we can capture a picture and get the GPS location of the user. Then upload the photo to Azure Blob (Cloud Storage) and Insert the photo record (photo path, tag, comments, etc) to the SQL Azure. The user interface and the flow of uploading photos of the camera page is shown in Figure003.
The Map function is used to get the photo record around the phone and the photos will be shown on the user’s Bing Map with its location. The Map function is shown in Figure002.

Moreover, the download function allows users to download “public” photos with the photo ID and for the “private” photos only the buyer can decrypt the photo with their private key. Nevertheless, the Photo album shows the history and details of the photos ordered by their time and we have lists of top “like” and “dislike” showing most famous photos.

B. Azure

In this project, we are using Windows Azure, a Microsoft Cloud platform, to build and host the application. The Azure platform consists of SQL Azure for database management and Azure Blob for data storage. We deployed our server application and database on Windows Azure cloud platform. In order to establish communication between our application and the server, it is required to build Windows Communication Foundation Services (WCF Service). For each service, we should implement an individual WCF Service by ourselves to control the way of communication. In our application, we made upload service for and SQL service.

C. Web Portal

There is a web portal for viewing and purchasing photos. Users can rate the photos so that good photos will show at the top list. The web portal has similar functions to our smartphone application. It is built under the Azure platform. This allows the news agencies that have subscribed our service to view the thumbnail of photos that our users are sharing. The news agencies can then browse the photos according to categories. If they choose to buy the photo, they can trade...
with the user. When the values of the photo confirmed and accepted, the original photo will be sent to them. Our web portal is as shown in Figure004.

![Figure004](image)

D. Security

If a user encountered breaking news, such as car accident on the highway or super discount of a boutique of he/she can immediately take a photo with our smartphone application. Then, the user can upload the photo as public and share the photo with his/her friends. However, if he thinks the photo has news value, he might choose to upload it as private with encryption. The application will then upload the AES encrypted photo with its thumbnail to the server. News agencies or individuals will be able to view the thumbnail of the photo in our web portal and application. Also, they can choose to buy the photo from the user.
2. System Details

In last semester, our system can be divided into 3 main parts. They are phone application and web development, security and database infrastructure. I was mainly responsible for the application development and database infrastructure part. For database infrastructure, I was participated in the establishment of connection between Windows phone and SQL Azure database. For phone application development, I was responsible for the camera page implementation, photo categorizing and tagging function and the user interface.

A. Connection between Windows Phone and SQL Azure database

Before implementing the infrastructure between windows phone and SQL Azure, I put a lot of effort to study the structure of the Azure as well as the SQL database in the Azure. The management platform of the Azure is user friendly so we can build our SQL database easily. The platform design is shown as Figure005.

![Figure005](image)

However, there are a lot of restrictions when we use other application such as web portal and smartphone application to connect to the Azure or we can say there are no direct connection between applications and the Azure. In order to allow the Windows Phone to communicate with Azure, we have to build WCF services to act as a middle man. Therefore, I was take part in building a WCF service called sqlhelper.svc in our project. SQLhelper.svc is a service that implemented by ourselves to receive database queries from the phone and
then executes them on SQL Azure. Before we can use this service we must create an object model which is an ADO .NET Entity Data Model which show the database schema of our SQL Azure database. The object model is shown in Figure006.

![Figure006](image)

Then, I was created a WCF contract so that we can add photo data record to the database. WCF contract is an interface the control the service of sqlhelper.svc. The WCF contract is shown in Figure007.

```csharp
public interface ISqlHelper
{
    [OperationContract]
    void AddPhoto(int id, int uploaderid, DateTime c_time, string HASH, int issecure, string geolong, string geolat, string PATH, string t_path, byte[] key);

    [OperationContract]
    List<topview> SelectTopViewQuery(string query);

    [OperationContract]
    List<photo> SelectPhotoQuery(string query);

    [OperationContract]
    List<user_table> SelectUserQuery(string query);

    [OperationContract]
    List<tags> SelectTagsQuery(string query);

    [OperationContract]
    int executeNonQuery(string query);
}
```

![Figure007](image)

After that, I was created a service that can add photo data record to SQL Azure database. It is not implemented by SQL query. However, this solved the problem of inserting data to database and this is the first communication between the Windows Phone and the Azure. The implementation of AddPhoto function is shown in Figure008.
Then, we tried to improve the connection by implementing functions to handle the SQL query. The code is shown in Figure009. However, we must use different function to execute different table’s query. The code that can return “photo” table instance is shown in Figure009. For “tag” and “user” table, there is a similar function.

```csharp
public List<photo> selectPhotoQuery(string query)
{
    using (var context = new MHREEntities())
    {
        ObjectQuery<photo> reQuery = context.CreateQuery<photo>(query);
        List<photo> result = new List<photo>();
        foreach (photo temp in reQuery)
        {
            if (temp != null)
            {
                result.Add(temp);
            }
        }
        return result;
    }
}
```

Figure008

Figure009
B. **Windows Phone Application Development**

For the phone application development, I was responsible for the photo categorizing and tagging functions, camera page and the user interface.

As we are making a business smartphone application, tagging and categorizing our photos is a must. This is because that can enhance our own management of users’ images. Tagging and categorizing photos will be very important if you have a large collection of users’ images. Moreover, categorizing function also helps customers to find photos easier. Since we are planning to make a transaction system that allow users sell their photos to news agencies, tagging of photos can make a huge difference in sales and number of transactions. In the application, I use different tags to simple categorize the uploaded photos. Together with the SQLhelper.svc service, I could use the SQL query to further categorize the photos with some “smart tags” that can be find out by “Comments” of the Uploaders. The camera page is shown in Figure010.

![Figure010](image-url)
3. Challenges

We mainly encountered two problems during the last semester. They are the problem of WCF services and the problem of immature SDK.

There are two problems that we encounter during different stages of the project. Problems mainly lies on the WCF services, as the system architecture is relatively new to other platforms, there are not much references that we can make use of.

A. Problems on WCF services
   As WCF services has a relatively new system architecture, there are not much references or library that we can make use of. Also, it is very difficult to find the solution of problems such as how to connect the windows phone with SQL Azure database on the web. Moreover, the Windows Phone Azure toolkit is extremely complicated so my team members and I gave up using it. Finally we decided to implement our own service, i.e photo uploading service and SQLhelper service, they have high reusability.

B. Problems of Immature SDK
   We encountered problems when using the Windows Phone SDK to develop applications. Our applications are developed using Silverlight but there are many references cannot be used in the development due to immature SDK. For example there no library supports the conversion between the images and bytes, so we need to implement this function by our own. The implementation really wastes our time.
4. Further Development

A. Anonymous Upload
When a user wants to share his/her photos but she don’t want to let others know their identity or don’t want to make any trouble, they can choose the function of Anonymous Upload. Then, he/she can upload his/her photos to our system without declare their identity and the news agencies can also get your photos and publish it to their media. The Anonymous Upload will be implemented by the method of ring signature.

B. Transaction Platform
We will make a secure transaction platform to allow users to get their returns if they upload a photo with news value and the news agencies or other users can choose and buy the photos in our web portal. Nevertheless, the secure transaction will proceed in our platform.

C. Blacklisting
In last semester, we implemented a “dislike” and “like” rating on the photos being uploaded to reflect the users’ response about that photos. Therefore, in the next semester, we will make a User Authentication function using their Windows Live ID or their Device ID so that we can blacklist some bad users who upload inappropriate photos by blocking their accounts.