

УДК 004.43, 004.9

G.G. Kirichек¹, Ph.D., As.Prof.
Zaporizhzhya National Technical University, Zaporozhye, Ukraine
kirichек@zntu.edu.ua

Cloud storage technology for the system of detecting software plagiarism in student projects on the programming

Propose used of the technology of cloud storage the SQL Azure for the system of assessment of plagiarism in learning subjects on the programming. The system provides analysis and processing of the student's program of projects, identification of cases of re-usable code. The study is aimed at solving urgent problems of scaling capacity of servers, the possibility of increasing amounts of data bases and resistance to loss of information.

Keywords: *cloud technologies, evaluation of plagiarism software code, the process of learning, data storage technology.*

Introduction

Today of "cloud" technologies are actively used in all developed countries [1], including in Ukraine, providing a fundamentally new, cost-effective opportunities for higher education.

Avoiding the traditional concepts while providing of the learning process in higher education (university) of Ukraine increases their competitiveness and demand for graduates from IT-professions in the labor market. Technology Rental (SaaS) software [2], allowing to use the working applications installed on remote servers, using a Web browser, can help reduce costs in higher education institutions in the conduct of the learning process [3].

At this stage of development of information systems, greater attention is paid the storage of the data. Urgent task is to solve the scaling capacity of servers, the possibility of increasing the volume available for the databases and the resistance to loss of information. Windows Azure, is one of the systems providing the possibility of solving all the above problems. It gives developers the means to implement the required functionality when working with cloud services.

Platform as a Service is a cloud service model where the vendor provides a platform for development and deployment of cloud application over an abstracted hardware. PaaS solutions enable users to directly develop their applications without worrying about the complexity of setting up the hardware or system software.

Azure is a popular platform that enables developers familiar with Windows-based programming to create cloud applications using.

Statement of the problem

The system of detecting software plagiarism provides the following functions: registration of the user, creation of user groups, import of project, search of the files for criteria, analysis of plagiarism in the structure of the project (identity the structure of directory and of the images), tracking of the time, the date, of the authors and changes in the program, analysis of the programming code depending on the type of file. Implementation of this system allows you to: control the reuse of code developed by students in the software projects, to create of the database are ready of learning projects [3,4].

Accordingly, the realized service should maintain and improve the quality of services, to provide portability and reliability of access of the data that developed and protected.

The main levels of the system being developed are presented in Figure 1.

For implementing service is proposed to use the platform Windows Azure, which is a web platform for cloud computing and services. It includes the main features of Windows Azure and a set of developer services that can be used separately or together.

By using the following products and components included in the selected platform Windows Azure, when implementing the service work with the system determining the identity of code in software projects of the students have improved the quality of service provided to students in the learning process [5,6]:

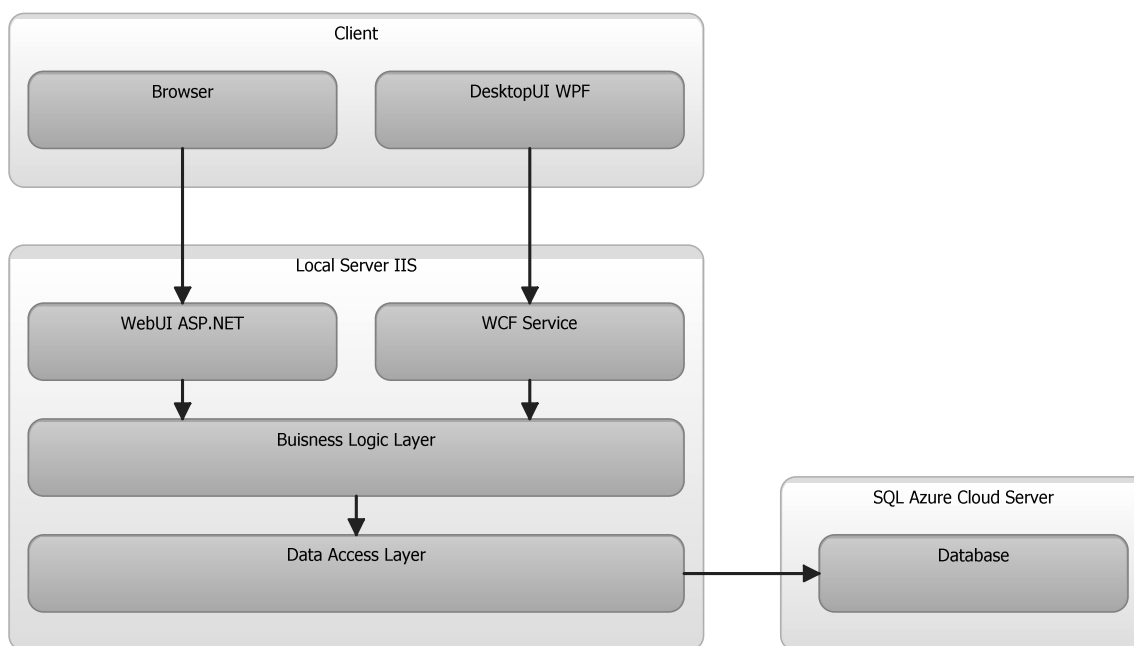


Figure 1 – Level diagram of the system

- Local development environment- Windows Azure SDK provides the tools and resources to help to packing, testing and deploying the application. In this environment, we create connection from the software to database in cloud with a server part of system of evaluation identity of the program code and the service on the client side. Tools for Microsoft Visual Studio, which extends Visual Studio to enable the creation, building, debugging, running and packaging of scalable web applications and services on Windows Azure.

- Windows Azure Compute – with a help of Windows Azure provides web roles (they supports IIS 7 and ASP.NET), worker roles, and VM roles. Web role is used for application development services that provide detection of software plagiarism and adding development projects in the database that runs in a virtual machine and used to developing web applications.

- Microsoft SQL Azure – use to store information (data) about the investigated for plagiarism projects, based on the provided by the service of relational databases. Using SQL Azure, we provision and deploy relational database solutions. Benefits include manageability, high availability, scalability, a familiar development model, and a relational data model.

- Windows Azure Caching – used to increase the speed of your application. It enables you to easily provision a cache in the cloud to be used from any applications or services that could benefit from caching. This includes a very common scenario of session state and output caching in ASP.NET.

Caching increases performance by temporarily storing information from other backend sources.

- Windows Azure Access Control Service (ACS) – is a cloud-based service that provides an easy way of authenticating and authorizing users to gain access to your web applications and services while allowing the features of authentication and authorization to be factored out of your code. In the designed system, this option allows SQL Azure to protect and improve the reliability of access to user data.

- Windows Azure Management Portal- provides access to hosted service deployment and management tasks as well as at-a-glance status information that lets you know the overall health of your deployments and accounts. The Management Portal organizes the components of your Windows Azure deployments with constantly refreshed information that is easy to discover and understand. Functions of the portal is used for quick setup, scalability and cost control to operate the system. That allows you to quickly react to the overflow of the database and expand allocated to it in the cloud volume.

Implementation of service

The first stage of implementation of the service includes two methods: the initial creation of the database in the cloud service, and Investigation of possibilities of migration working system with the available data.

To do this in SQL Azure, you can use one of the ways:

- creation of databases by writing queries in manual mode;
- creation of the database structure using SQL Azure portal;
- database editing using SQL Server Management Studio;
- import already generated database from SQL Server by using SQL Azure Migration Wizard.

After registration, a database administrator at the Microsoft SQL Azure portal was created the primary server for the system. «North Europe», selected when choosing a location server region which made it possible to minimize delay in the transmission of data to end users of the system.

For the primary database of the system selected backup storage method. The database is available in 3 copies and located on different hosts of data collection platform-level data center. The initial call to the database of the system used in the learning process, always directed to a site that hosts the primary replica.

If the primary replica is not available, SQL Azure Fabric enhances one of the secondary replicas to the rank of primary and place secondary replica on another node. Primary and secondary replica can exchange roles, if the node with the primary replica is overloaded, and the secondary idle.

Database for the system created by selecting the appropriate menu item in Control Panel or by running the following query:

```
create database [PlagiatDB] collate cyrillic
_general_100_CI_AS (MAXSIZE = 5 GB).
```

This query creates database with a maximum size of 5 GB. In the future, its size can be increased by executing the following query:

```
alter database [PlagiatDB] modify
(MAXSIZE=10GB).
```

Based on the general model and existing relationships, creates tables of software plagiarism detection system in the educational projects of students (Fig. 2), with the help of creation and execution of certain queries:

```
...
create table [Group]
(
ID uniqueidentifier primary key clustered,
Name nvarchar (40) NOT NULL,
ModifiedDate datetime NOT NULL
CONSTRAINT
DF_GroupDetail_ModifiedDate DEFAULT
(getdate())
)
...
```

This SQL query creates a table in a database to store information about the study groups.

```
...
create table [Man]
(
ID uniqueidentifier primary key
clustered,
Name nvarchar (40) NOT NULL,
ModifiedDate datetime NOT NULL
CONSTRAINT
DF_GroupDetail_ModifiedDate DEFAULT
(getdate()),
GroupID uniqueidentifier FOREIGN
KEY
REFERENCES
Group(GroupID),
Email nvarchar (40) NOT NULL,
Password nvarchar (40) NOT NULL,
AccountName nvarchar (40) NOT
NULL,
)
...
```

Class Man - it is the user himself. In addition to standard features such as user name, password and email, it includes a method GetProjectList (), allowing access to the project, which is owned by the user.

Class diagrams show the static representation of the model and the relationship between the classes and interfaces.

SQL Azure supports standard security model of SQL Server, this means that credentials can be used on the server level for all databases, and also using different credentials for the different users in a particular database. When creating a new service in the form of SQL Azure server with the master database creates an administrative login. To create other users use the query:

```
create login LocalAdmin with password =
'password'.
```

Creation of rights to access the database, performed by the registration in the user database, corresponding to a given login:

```
create user LocalAdmin _user from login
LocalAdmin.
```

To add a rights group elders to create logins for students execute a query that adds the appropriate user database «master» in the role «loginmanager» in SQL Azure.

```
exec sp_addrolemember @rolename =
'loginmanager', @membername = N' LocalAdmin
_user'.
```

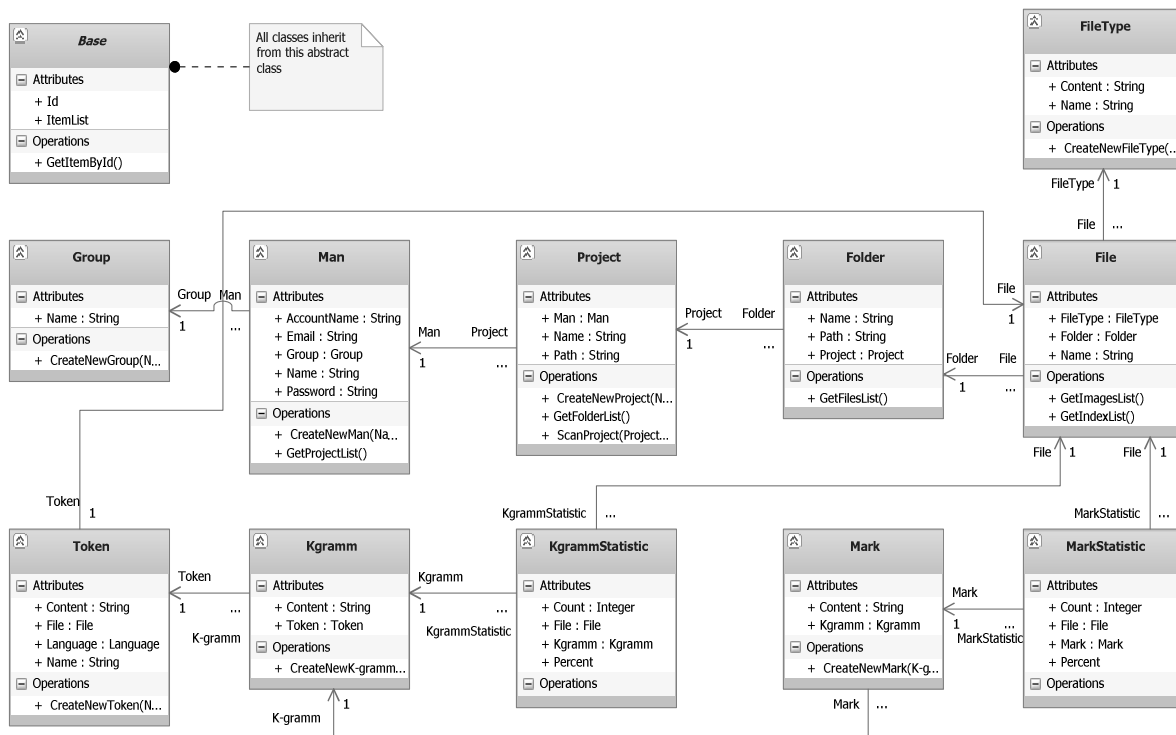


Figure 2 – The class diagram for implemented system

Migrating structure and data from an already established base can be accomplished by using SQL Azure Migration Wizard, which is designed to help you migrate your SQL Server 2005/2008/2012 databases to SQL Azure. SQL Azure Migration Wizard will analyze your source database for compatibility issues and allow you to fully or partially migrate your database schema and data to SQL Azure.

In the next stage the database that is stored in the cloud service connects to the local server deployed on the IIS server.

The structure of the server (Fig. 1) consists of a data access layer, business logic level, the implementation of ASP.Net portal that provides a web interface to work with the system and Windows Communication Foundation service, providing access for the client desktop applications.

At the level of data access is used a specially formed unit to connect to the database to load the objects system of software plagiarism detection in students educational projects:

```
<connectionStrings>
  <add name="DefaultConnection" connectionString="Server=tcp: <database_server>.database.windows.net,1433;Database=<database_name>; User ID=<user_name> @ <database_server>; Password =<myPassword>; Trusted_Connection=False;
```

```
Encrypt=True;
MultipleActiveResultSets=True"
xdt:Transform="SetAttributes"
xdt:Locator="Match(name)"/>
</connectionStrings>
```

At the level of business logic Implemented functions of user registration, creating groups of users importing of projects, file search by the set criteria; analysis of software plagiarism in the structure of the project (the identity of the structure of directories and images); tracking the time, date, authors, and changes to the program; analysis of program code, depending on the type of file. At this level, also implemented module of transforming information in the structures for easy visualization.

At the level of the visual interface is implemented ASP.Net web site. It is used as an entry point through which students and teachers, at any time and from any remote location, can have full access to the system in the design, analysis and protection of software projects, as well as checking for the uniqueness of their code.

The system, located on the server includes a WCF service that provides access for desktop applications to services of system. Each student and teacher can install the application on their computer and use the system more efficient by increasing the speed, which is achieved through the mechanism of caching objects:

```
[ServiceContract]
```

```
public interface IPlagiatWcfService
{
    [OperationContract]
    public List<Account> SelAccounts();
}
```

Реалізація інтерфейса:

```
public class PlagiatWcfService:
IPlagiatWcfService
{
    public List<Account> SelAccounts()
    {
        /* implementation of the accounts
        sampling method */
    }
}
```

On the client side application implements an interface to access WCF service:

```
...
WcfServiceReference.PlagiatWcfServiceClient
t wcf = new WcfHosting.WcfServiceReference.
PlagiatWcfServiceClient();
wcf.Open();
```

```
List<Account> accounts = wcf. SelAccounts
();
wcf.Close().
```

Setting up the service and cost calculation

The developed system consists of multiple of the copies application for server and the client.

To run the application on the server of university it's necessary:

- install and configure IIS, which is included in Windows Server 2008;
- install the application server which runs the portal for working with system, as well as expand service of the access of students and teachers to databases.

Connecting to the main modules of the database is automatically.

Students and teachers, at the request, can install a desktop version of the application on the client equipment or used a portal for ASP.Net.

For accept the additional decision about the effectiveness of the introduction of the service performed the calculation of the cost of its use. Figure 3 shows the calculation of the cost of service maintenance.

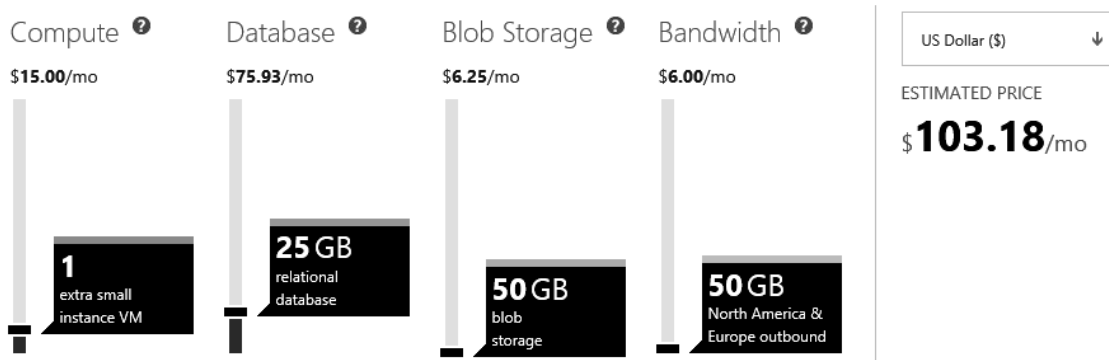


Figure 3 – Calculating the cost of operating the system

Conclusion

The introduction of an innovative platform based on the cloud-technologies, in the learning subjects on the programming allows: to increase student and teacher mobility for any form of providing knowledge; to improve reliability of the data; to improve access speed; ease of adjustment and change.

The process of learning becomes more interactive: students can provide feedback to the teacher, using his proposed educational services.

"Cloud" services improved the efficiency of the educational process. Designed service meets all the requirements and assigned tasks. Software as a Service (SaaS) provides access to applications to end users over the Internet without upfront investment in infrastructure and software. For accept the additional decision about the effectiveness of the described service performed the calculation of the cost of its use.

References

1. Linlin Wu. SLA-based admission control for a Software-as-a-Service provider in Cloud computing environments / Linlin Wu, Saurabh Kumar Garg, Rajkumar Buyya // Journal of Computer and System Sciences. – 2011. – [Режим доступа]. – <http://128.250.29.18/reports/AdmissionControlInClouds-JCSS2011.pdf>.

2. Dinkar Sitaram. Chapter 3 - Platform as a Service / Sitaram Dinkar, Manjunath Geetha // Moving To The Cloud — Developing Apps in the New World of Cloud Computing. – 2012. – P. 73-152.
3. Киричек Г.Г. Модель оцінки плагіату програмного коду на основі системи контролю версій / Г.Г. Киричек, О.О. Киричек // Східно-європейський журнал передових технологій. – Х.: Технологічний центр, 2012. – №2/2 (56). – С. 25-32.
4. Киричек Г.Г. Оцінка подібності програмного коду в навчальних проектах студентів / Г.Г. Киричек, О.А. Амонс, О.О. Киричек // 14-а міжн. наук.-техн. конф. "Системний аналіз та інформаційні технології" SAIT 2012, 2012 р. : тези доп. – К.: НТУУ «КПІ», 2012. – С. 2.
5. Управление базами данных и именами входа в SQL Azure [Текст] / Библиотека MSDN. – [Режим доступа] : <http://msdn.microsoft.com/ru-ru/library/ee336235.aspx>.
6. SQL Azure [Текст]. – [Режим доступа] : <http://habrahabr.ru/post/66815/>.

Надійшла до редколегії 11.04.2012

Г.Г. КИРИЧЕК

Запорізький національний технічний університет,
м. Запоріжжя, Україна

ХМАРНІ ТЕХНОЛОГІЇ ЗБЕРІГАННЯ ДАНИХ ДЛЯ СИСТЕМИ ОЦІНКИ ПЛАГІАТУ В ПРОГРАМНИХ ПРОЕКТАХ СТУДЕНТІВ

Запропоновано використання технології хмарного зберігання даних SQL Azure для системи оцінки плагіату при вивченні дисциплін з програмування. Система забезпечує аналіз і обробку результатів студентських програмних проектів, визначення випадків повторного використання коду. Дослідження спрямоване на вирішення актуальних завдань масштабування потужностей серверів, можливості збільшення обсягів баз даних і стійкості до втрати інформації.

Ключові слова: хмарні технології, оцінка ідентичності програмного коду, навчальний процес, технології зберігання даних.

Г.Г. КИРИЧЕК

Запорожский национальный технический
университет, г. Запорожье, Украина

ОБЛАЧНЫЕ ТЕХНОЛОГИИ ХРАНЕНИЯ ДАНЫХ ДЛЯ СИСТЕМЫ ОЦЕНКИ ПЛАГИАТА В ПРОГРАММНЫХ ПРОЕКТАХ СТУДЕНТОВ

Предложено использование технологии облачного хранения данных SQL Azure для системы оценки плагиата при изучении дисциплин по программированию. Система обеспечивает анализ и обработку результатов студенческих программных проектов, определение случаев повторного использования кода. Исследование направлено на решение актуальных задач масштабирования мощностей серверов, возможности увеличения объемов баз данных и устойчивости к потере информации.

Ключевые слова: облачные технологии, оценка идентичности программного кода, учебный процесс, технологии хранения данных.