Online C/C++ Compiler using Cloud Computing

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***Abstract*: Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort. The paper aims to describe an online compiler which helps to reduce the problems of portability and storage space by making use of the concept of cloud computing. The ability to use different compilers allows a programmer to pick up the fastest or the most convenient tool to compile the code and remove the errors. Moreover, a web-based application can be used remotely throughout any network connection and it is platform independent. The errors/outputs of the code are stored in a more convenient way. Also, the trouble of installing the compiler on each computer is avoided. Thus, these advantages make this application ideal for conducting examinations online.**

Keywords –Online Compiler, Cloud computing, Compiler

I. Introduction

Cloud computing builds on decades of research in virtualization, distributed computing, utility computing, and more recently networking, web and software services.[1]

It implies a service oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership and on-demand services among other advantages.[1] The National Institute of Standards and Technology (NIST) defines 'Cloud Computing' as 'a model for enabling easy, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.' It does not require the end-user to know the physical location and configuration of the system that provides these services to the end-user. The main disadvantage of cloud computing is the loss of control over the infrastructure used by the users. However, this disadvantage is eclipsed by many an advantages that cloud computing offers. Some of them are lower costs, better computing, location independence, better security (although this advantage in clouded with doubts of loss of some sensitive data). There are five known ways of providing cloud computing currently viz. public, private, community, combined and hybrid cloud computing. A compiler, which is the heart of any computing system, transforms source code from a higher level language to a lower, machine level language. This is mainly done in order to create executable files which can then be 'run' in order to execute the program and its instructions. Every compiler primarily consists of three parts viz.

1. The Front end: This checks the semantics and syntax of the higher level code (written by the user). Other functions like type checking and error reporting are also performed by the frontend.
2. The Middle end: This performs the optimization through removal or useless code, relocation of computation depending on the context.
3. The Back end: This is the part where the translation of the language actually takes place.

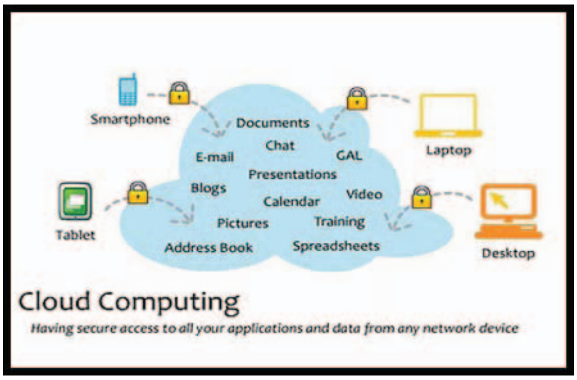

Fig. 1 – Cloud Computing

II. Need for Project

The main advantage of cloud computing over the other non-network methods is of faster processing. Also, many processors can be used remotely, without the knowledge of the user(s), in order to expedite the processing. Thus, keeping this main advantage in mind, the main reason for creating the project is to provide a centralized compiling scheme for organizations or institutions. Also, it will act as a centralized repository for all the codes written. The other major advantage that this system will have over the others is that it will make the users system lightweight i.e. there will be no need to maintain separate compilers/SDK's at the client-side. Thus, for educational institutions this will prove to be highly efficient. Also, the process of maintenance and distribution of dynamic usernames and passwords will be

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greatly simplified. Also, authentication and personalized task distribution will be made possible.

III. ONLINE COMPILER

The primary functions of our project are:
Compile option: This would take the code in the text box to the server side for its compilation and at the server side the compiler package has been imported.
Execute Option: The user is provided with the links of all the executable files that were present in his or her folder and were already compiled at least once without errors.
Start test option: Till this button is not clicked the test does not start and the student cannot start writing the code.

All programs and their timestamps of when were they compiled are stored at the server side database. OCC is an online compiler cum interpreter, and a simple collaboration tool. It is a pastebin that executes code for the user(s). The user(s) paste/write the code in the main window and the OCC compiles it and stores an executable file in its database. This .exe file can then be accessed directly and downloaded to the user's terminal using a URL provided by the OCC itself. The feature of downloading the executable file onto the user's terminal ensures that malicious codes (for example: code to format the C: drive on the server itself) written on the server will not execute on the server itself (thereby keeping the server intact and safe).

IV. DOT NET – AN INTRODUCTION

According to Microsoft, the developer of MS.NET, 'the .NET framework is the Microsoft Web services strategy to connect information, people, systems, and devices through software. Integrated across the Microsoft platform, .NET technology provides the ability to quickly build, deploy, manage, and use connected, security-enhanced solutions with Web services. .NET-connected solutions enable businesses to integrate their systems more rapidly and in a more agile manner and help realize the promise of information anytime, anywhere, on any device.'

A. ADVANTAGES

This new generation of technology is based on Web services - small building-block applications that can connect to each other as well as to other, larger applications over the Internet. .NET combines unprecedented developer productivity with performance, reliability, and deployment. .NET makes building real world Web applications dramatically easier. .NET server controls enable an HTML-like style of declarative programming that let a person build great pages with far less code. Displaying data, validating user input, and uploading files are all amazingly easy. Some of the other main advantages are: Interoperability, Common Language Runtime Engine, Language Independence, Base Class Library, Simplified Deployment, Security and Portability.

B. DISADVANTAGES

Applications using the MS .NET framework tend to use much of the system resources and especially those which are running on Microsoft framework. Also, loss of trade secrets and by passing of license is the major problem caused by reverse engineering. Regular garbage check and collection makes the application pause for sometime from execution.

V. PROJECT ARCHITECTURE

The system uses a dual-layered architecture. The lower layer consists of clients, which are of lower configuration. The upper layer consists of the server.

The important components of the upper layer are described as below:

1. A web framework, Visual studio 2010, which handles the work of scripting and compilation of code.
2. IIS sever to handle the client request.
3. Database which stores the client information.
4. The 'cloud hard disk' is a shared resource.

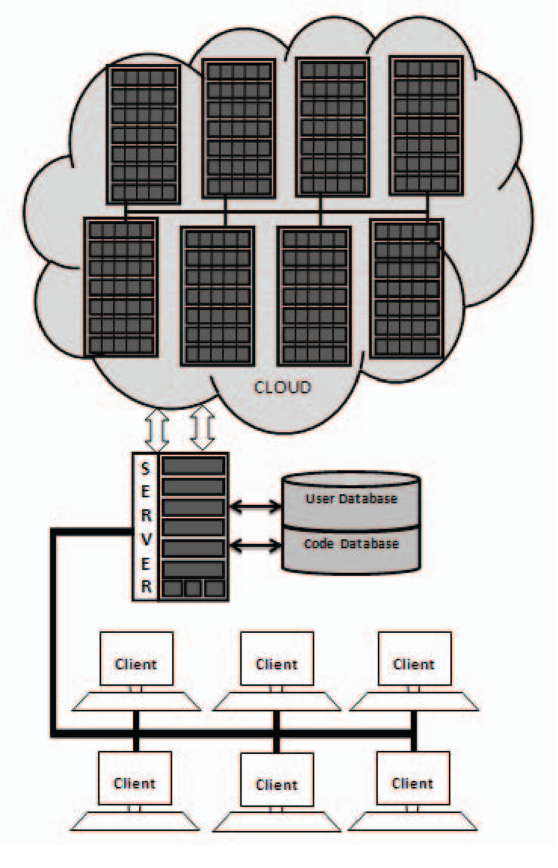
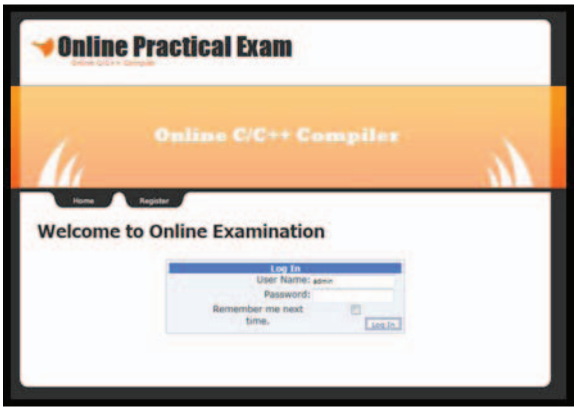


Fig. 2 – Online Compiler Architecture

VI. Project Implementation

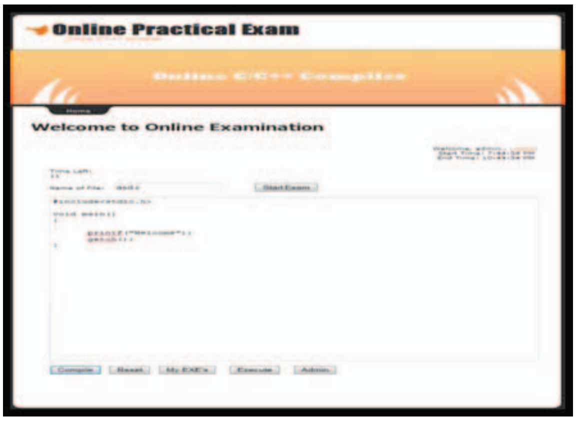
While developing the software it is imperative to decide apriori which programs will be executed on the client side and which programs are to be executed on the server side. Client side programs are applets which are transferred to the client machine entirely on the request of the user. They are executed only on the client machine and not on the server. This allows for sharing the computational cost between the server and client.

This approach is used when program to be transferred to users is moderate in size, is cached on client machine or the data to be transferred between server and client in case the application is run on the server is very large in volume. In case of platform independent solutions, such as Java, causing lesser computational performance may be prohibitive. With the Online Compiler, much less information has to be passed on, to the server. The server executes instructions based on the given information and sends the results back to the local machine that made the initial request. This is used when the software package is large or is not to be released to user, or when amount of data to be transferred is small. However, large number of clients that access the server simultaneously would make CGI-based approach undesired. These software design problems were considered and solved in the Online Compiler. The user interface is programmed in HTML enhanced with ASPX. It was assumed that the user will use his or her favorite text editor to create and correct program files. This assumption allowed to create a very simple front-end that loads quickly and is platform independent. Although the front end is designed to be as simple as possible with only a few commonly used options, it is sufficiently functional and can be used quickly. The server side part of the application is implemented using ASPX written in ASP.NET that handles the communication between a user and compiler. The script does the file managing, runs compilers and processes the compilation results. The result is the source code listing or a list of errors sent back to the user.



User Name: admin
Password:
Remember me next time. □

Fig. 3 – Front End of Online Compiler

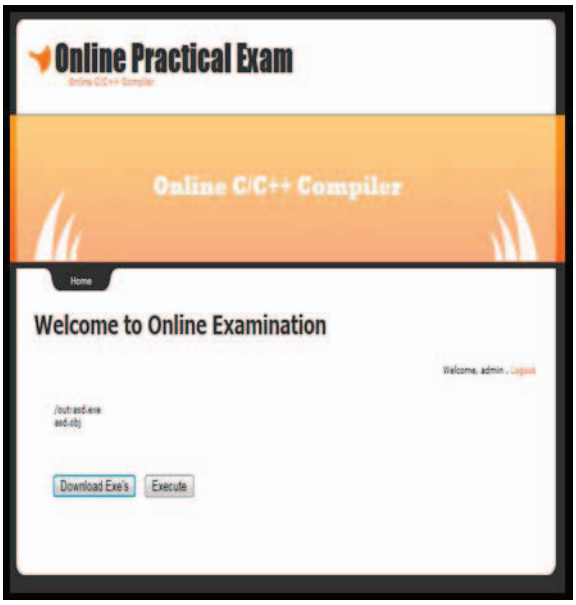


Start Time: 7:44:34 PM
End Time: 10:44:34 PM
Time Left:
Name of File: asd.c

```
#include<stdio.h>

void main()
{
        printf("Welcome");
        getch();
}
```

Fig. 4 – Code Window of the Online Compiler

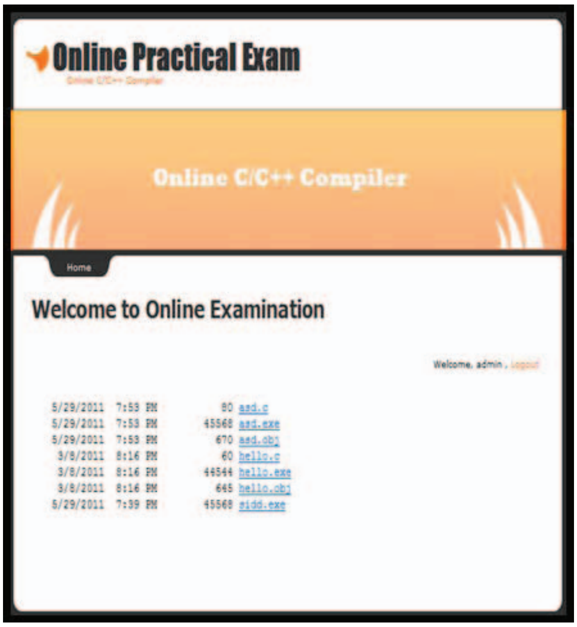


/out:asd.exe
asd.obj

Fig. 5 – Window after Compilation of Code

To use Online Compiler, the user(s) paste the program code to the web page form. This can be done from the user's compiler text editor, or from any text editor.

As soon as the user 'submits' the form the compilation will be performed by CL compiler on the server in batch mode. The ASP script located on the server has to deal with the translation of these common options to the actual options of compilers from different vendors. It also handles the compilation errors and processes the report.



Online Practical Exam

Online C/C++ Compiler

Online C/C++ Compiler

Welcome to Online Examination

Welcome, admin , Logout

```
 5/29/2011  7:53 PM        80 asd.c
 5/29/2011  7:53 PM     45568 asd.exe
 5/29/2011  7:53 PM       670 asd.obj
  3/8/2011  8:16 PM        60 hello.c
  3/8/2011  8:16 PM     44544 hello.exe
  3/8/2011  8:16 PM       645 hello.obj
 5/29/2011  7:39 PM     45568 sidd.exe
```

Fig. 6 – URL generated by the Online Compiler

X:\Downloads\asd.exe

```
Welcome_
```

Fig. 7 – Output Window

VII. Use of Project

The purpose of the project was to allow students to get familiar with different compilers and compiler optimization techniques rather than make another huge GUI application to wrap compilers.

The major use of the 'Online Compiler' is in conducting university practical examinations through our project. A separate cloud would be constructed at the university location that is the server.

Every student would in advance have a user id and password to log in and start with the examination. There would be a URL provided to the students which would lead them directly to the login page of the application. Whenever the student logs in and clicks on the start exam option the timer starts for 3 hours. After the time is up, the page would go in the log out mode automatically.

VIII. Conclusion

By integrating and enhancing the capabilities of these essential technologies, we hope to introduce the 'Online Compiler' and to contribute to the current examination system. It would basically be a platform for students of the university to give their practical examinations online. There would be a cloud where there will be a server which would have the power to compile the student`s code stored on another machine.

As compared to the current scenario where each machine should have the C/C++ compiler installed separately and an examiner has to visit each machine to check each and every student`s code. This would eliminate the need to install compilers separately, the examiner does not need to visit each student but can check the codes at the centralized server as well as each students record is maintained for future references. Another advantage of such a project is that whenever the compiler package is to be upgraded it can be done easily without again installing it on each and every machine.

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