Cross Compilers

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Abstract: Compilers are used to run the programs and convert them from text format to executable format. Once a program is compiled it becomes platform dependent and the same program code cannot be carried to multiple systems. A compiler which is to be installed manually on every system requires a lot of space. It is also not easy to carry the same program code to multiple systems if the situation doesn't permit the usage of a single system. For each language, a different compiler is needed to be installed. To avoid these drawbacks, a solution is proposed in this paper that is a cloud based cross compiler. The user would be given an option to select the language in which he wants to compile the program. The software will compile the program and return the output to the user. It reduces the problem of storage space and portability by using the cloud computing. The ability to used different compilers allows the user to choose the fastest compiler to compile the code. Also, the trouble of installing a compiler on each computer is avoided. This paper would be implementing a private cloud on which the software will be hosted. The software would be provided to the end user using a PaaS cloud.

Keywords: Cloud computing, private cloud, PaaS, web-services.

I. INTRODUCTION

Cloud computing point towards a service oriented architecture, reduced information technology overhead for the end users; provide greater flexibility, reduced total cost of ownership and on-demand services among other advantages. Cloud-based compiler mainly deals with providing a platform to compile and execute programs that are not dependent on any platform related restriction or complication [1]. The compiler can be used to implement and run JAVA, C, C++, NET programs and get the executable files or directly view the output.

Cloud computing has differed from client-server technology in which one server provides the services to many users, but in this technique, many problems arose like the server is overloaded hence slow down the process and a user has to wait for compilation. This problem is overcome into the cloud computing where many cloud stations are situated at different locations which are linked with main cloud station that is central cloud station. This reduces the problem of overloading of data into the cloud and service provided by the cloud is very fast and convenient. The cloud can be implemented as a public, private or hybrid cloud. Cloud computing is not only simply collecting the computer resources but it also provides a management mechanism for giving best kind of services to millions of user simultaneously and get the output on a client side.

The benefit of cloud computing over the other non-network methods is of faster processing. Thus, keeping this main advantage in mind, the centralized compilation scheme based on cloud computing is developed.

Some key characteristics of cloud computing are:
- Agile development improves with user's capacity to re-provision hi-tech infrastructure resources.
- Low Cost is claimed to be cheap and in a public cloud deliverance model capital expenses is converted to operational expenses.
- Performance is monitored, constant and loosely coupled architectures are constructed by means of web services as the system interface.
- Virtualized and dynamic in which applications can be straightforwardly migrated from one physical server to another.
- Confined storage and management could improve due to centralization of data, increased security and focused resources.
- Centralization of communications in locations with lower costs.
- Maintenance of cloud computing applications is easier.

Following Fig. 1 shows cloud computing which refers to the use and access of multiple server-based computational resources via a digital network (WAN, Internet connection using the World Wide Web, etc.).
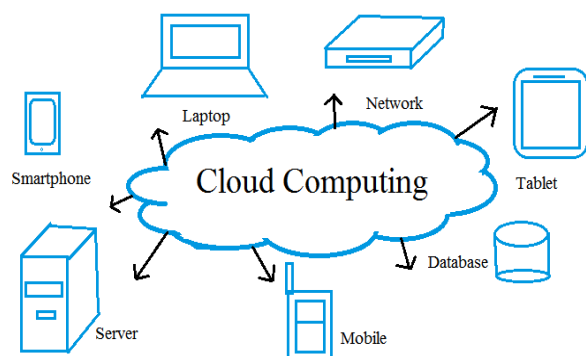

Fig. 1 Cloud computing

Cloud users may access the server resources using a computer, notebook, Smartphone's, or another device. In cloud computing, applications be provide and managed by the cloud server and data is also stored distantly in the cloud configuration.

A. Scope

The facility to use diverse compilers allows the programmer to choose the fastest or the most convenient tool to compile the code and remove the errors. Thus these advantages make this application ideal for conducting online examinations [2].

Following are some future scope in cloud based cross compiler.

- Provide more compilers.
- Implement a security mechanism.
- Provide efficiency meters and code.
- Create Web API's.
- Mobile Applications.
- Collaborative Editing.

B. Motivation and objective.

- The main objective is to provide very convenient online tool which compile and execute program into a single editor which is common for all languages.
- To provide security to the user data by using private cloud.
- To make available space to user.
- To offer compiler as a PaaS service on cloud.
- To give User Friendly Interface.

II. RELATED WORK

The related work includes strategies, advantages, and drawbacks of the existing systems, which are overcome in the proposed system. The different approaches can be used for providing a platform to the user where he can write and execute the code from anywhere at any time. Several related works have studied for how to implement such a platform by using the concept of cloud computing.

A. Online C/C++ compiler using cloud computing

A.N. Ansari, proposed Online C/C++ compiler using cloud computing which offers a centralized compiling scheme to organizations or institutions [5]. Also, it will act as a centralized source for all the codes written. The system is light weighted i.e. it does not require to install isolated compiler/SDK on the client-side machine. Thus, it does not utilize the user space. The system uses a dual-layered architecture. The lower layer comprises 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:

- A web framework, Visual studio 2010, which handles the work of scripting and compilation of code.
- IIS server to handle the client request.

- Database which stores the user code and information.
- The shared hard disk.

The major disadvantages of the systems include applications using the MS.NET framework tends to consume much of the system resources and particularly those which are running on Microsoft framework. Also, loss of trade secrets and by the passing of license is the major problem caused by reverse engineering. As it regularly performs garbage checking and collection the application pause and slows down for some time from execution.

B. Online Compiler as a Cloud Service

Arjun Datta, recommended Online Compiler as a Software as a Service (SaaS). The online compiler provides service for compiling programs written in C, C++ or Java [7]. It does not require having a compiler installed on client machine. The code can be compiling by just uploading it.

The architecture of the system is divided into 3 tiers:

- User Interface Tier: The user interface is a web application hosted on the IIS Serve which provides the user an interface to submit their programs.
- Controller Tier: The Controller Tier manages the communications between User Interface Tier and Compilation Tier.
- Compilation Tier: The compilation tier consists of "n" number of compiler servers which are used to assemble and perform the programs.

Each compiler server checks its CPU handling and available RAM before accommodating a program to compile it, run it and generate the output. If the CPU usage and available RAM are above a pre-defined entry value then it discards the program. On successful compilation and execution of a program, the generated output i.e. an error or output is shown to the user on GUI. As the compilers are present on the different server, the maintenance of the compilers is difficult. The cost of implementing the SaaS increases and data leakage may be there as it gives overall control to cloud provider.

C. .Net Compiler Using Cloud Computing

Kavita M. Garawad, offered a system which provides centralization compilation schema for the .net code using cloud computing [8]. The software is hosted on the cloud and it is used as the service over the cloud. The user need to register first and log in with the username and password after that user select the file and click on the compilation button, the code is submitted to the cloud for the authorized users otherwise, it shows unsuccessful submission and code is encrypted during submission and decryption of the code takes place during receiving the code. After the compilation, the fault generated or the output is given to the user on client side window.

The main advantage of the proposed system is that it reduces storage space in the systems on the user side and

also reduces the time needed to install the visual studio in the systems. The GUI of the system is elegant and simple for coding. The system provides only the .net compiler. It uses the SaaS which does not provide security to user data.

D. Browser Based IDE

Another work was conducted by Raut [9], who introduced a browser-based Integrated Development Environment (IDE) that facilitates programming, compiling, debugging, running, and testing Java programs online. It allows creating projects, sharing them with other users, and developing in a real-time collaboration. However, this compiler is only limited to basic Java capabilities; i.e. advanced technologies like GUI, Servlet and networking are not available yet in the current implementation of the compiler.

The aforementioned approaches focused on the providing the platform where the user can compile the code but not concerned with providing the security for user data and maintenance of the server. The capabilities of a compiler are less and only some compilers are implemented by the system. The system must be proposed which will overcome the disadvantages of previously proposed approaches. It can be possible using different techniques.

The some of the above-mentioned approaches used SaaS whose major drawbacks are little control over deployment, upgrade and testing methodology and Cloud provider has full access to customer's data unless cryptography is used. In this paper, PaaS is used which can avoid these drawbacks and it is cost effective also. The private cloud is used which provides security to the greater extent.

E. Extensions Over Traditional Compilers

Cloud-based compiler schema mainly deals with providing a platform to compile and run programs that are not dependent on any platform associated restriction or complication [1]. It can be used by any user who has contributed to the compiler and can use it for a specific period of time. It also helps the naïve user for learning new languages easily.

The functionalities that are provided by the cloud compiler are:

- Compile on the Go: It offers the editor where the source code can be written. The code can be implemented on the cloud itself and the output can be viewed at the same time.
- File Management: The source code can be saved in a text format in the space that is allocated to each user. The codes of every user are saved in the separate folder.
- Scalability: The amount of space dedicated to the user can be extended by buying a bigger storage space.
- Blogs: The user can post the ideas or the concept which can be viewed by the other user.
- Forum: The user can log on into a forum where he can discuss the various problems or the solution to problems he is facing and also can suggest the solutions to others.

- Security: It provides security by implementing a sandbox that is a security mechanism for separating running programs. It is often used to execute untested code, or unfrosted programs from unverified third-parties, suppliers, untrusted users and untrusted websites.

III. SYSTEM ARCHITECTURE

A. Three tier architecture

A Multi-tier architecture, often referred to as three-tier or n-tier architecture provides better application scalability, lower maintenance, and increased reuse of components. The three-tier architecture offers a good technology neutral method of building client or server applications with vendors who employ standard interfaces which provide services for each logical 'tier'. Through typically tried interfaces, services are arranged available to the application.

A single application can employ many different services which may reside on dissimilar platforms or are developed and maintain with diverse tools. This approach allows a developer to influence investments in existing systems while creating the new application which can utilize existing resources.

- Presentation Tier: occupy the peak level and displays information associated with services available on a website. This tier communicates with other tiers by sending results to the browser and additional tiers in the network.
- Application Tier: Also called the central tier, logic tier, business logic or logic tier, this tier is pulled from the presentation tier. It controls application functionality by performing comprehensive processing.
- Data Tier: The database servers where information is stored and retrieved. Data in this tier is kept independent of application servers or business logic.

Following Fig. 2 illustrates three tier architecture for proposed system.
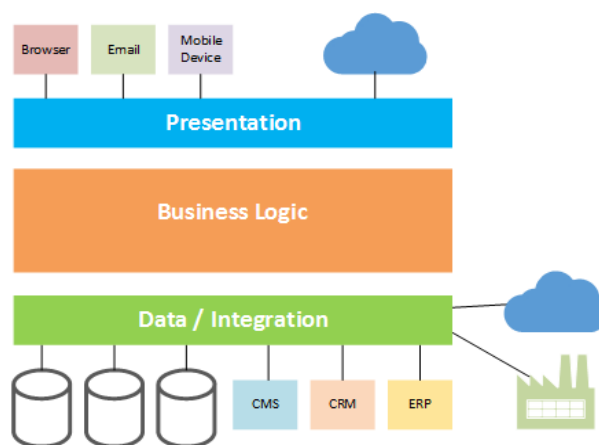

Fig. 2 Three tier architecture [10].

B. Modules of proposed system

An architectural model is an affluent and precise diagram, formed using available standards, in which the primary concern is to demonstrate a specific set of tradeoffs inbuilt in the structure and design of a system or environment. An architectural model is an appearance of a point of view in software architecture. The overview of the system is presented in Fig. 3 shows the system architecture.
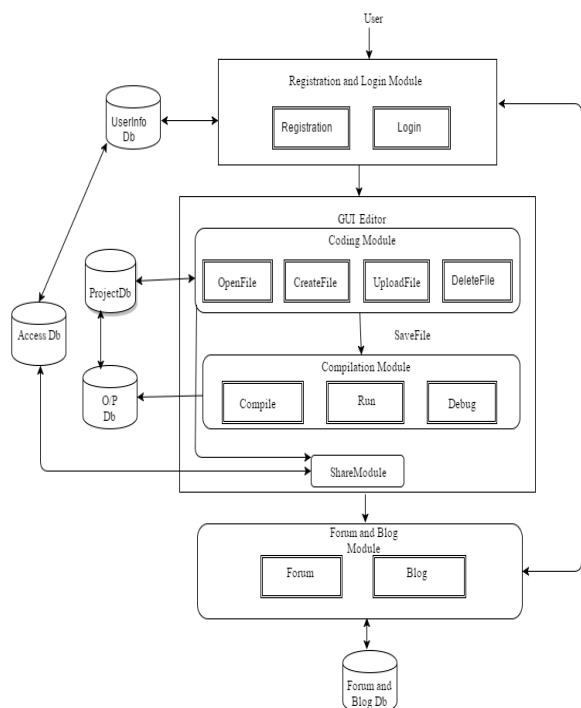

Fig. 3 System architecture.

Following are the modules used in this system.

- Registration and login module: This module is used for authenticating the user. User first register and log in into the system. After registration system allocates a new space to the user.
- Coding Module: User can perform various operations like create, delete, upload the source code.GUI editor is provided to the user for coding.
- Compilation module: In this module, user compiles, debug and run his program.
- Share Module: User can share his code with different users.
- Forum and blog module: In the forum, the coding related errors are discussed and solve. In the blog, the user can post their code.

C. Data flow diagram

A data flow diagram (DFD) is a graphical demonstration of the "flow" of data throughout an information system, modeling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated.

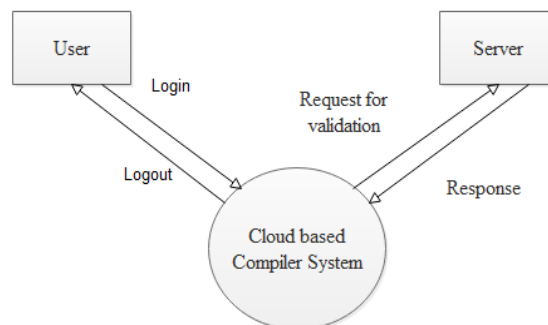Following Fig. 4 shows DFD level 0 also called as fundamental/context level DFD.

Fig. 4 DFD level 0.

Fig. 5 shows DFD level 1. It represents the entire process activities in the core system.
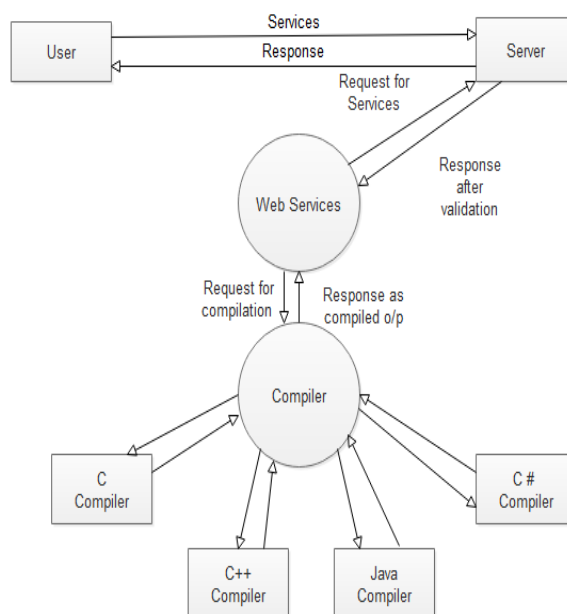

Fig. 5 DFD level 1.

IV. CONCLUSION

We have suggested a system providing online .NET, C, C++ and JAVA compilers to the user by implementing a private cloud. The private cloud provides the security for user data. The cloud used as a platform as a service which gives more convenient way to manage the application and privacy of data without worrying about the infrastructure and maintenance of hardware. The web services are used for interfacing between the cloud server and the compilers. As system implemented provides some basic compilers, the other compilers can also be included.

In the future, intelliscence may be added to the editor so that naive user can also learn and do the programming.

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