

A Survey, On Hybrid Smart Compiler Using Cloud Computing

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Abstract: Cloud has emerged as a computing infrastructure that enables rapid delivery of computing resources in scalable and virtualized manner. In today's era, organization of system with compiler installed, unavailability of highly configured system to run the program, necessary resources needed such as OS and plugins are not available. To resolve these issue we come across the need of online compiler nested in cloud which can compile the code online and which can be accessed from any device, no high configuration is required and multiple language can be used in single platform. The ability to use different compilers allows the programmer to pick up faster or the most convenient tool to compile the code. The study evaluates its multidimensional capabilities by developing a web based application for compilation and conversion of codes written in different language like Java, Python and C++ etc.

Index Terms: Cloud Computing, Online Compiler, Online Converter

I. INTRODUCTION

Compilers are used to run programs and convert them from a text format to executable format. A compiler that is to be installed manually on every system physically requires a lot of space and also need to be configured and installed. When a program is compiled it becomes platform dependent. It is also not easy to carry the same program code to multiple systems if situation doesn't permit the usage of a single system. Another drawback reveals that we would need to install a different compiler on each language on which is desired task. These challenges imposes the study of the online compiler for multiple languages.

A. Cloud Computing

Cloud Computing is an internet based computing where the consumers are provided with resource like high performance computation, power, storage, security, development environment, software, on demand usage, memory bandwidth etc.

National Institute of Standards and Technology (NIST) defined that "Cloud computing is a model for enabling ubiquitous, convenient, on demand network access to shared pool of configurable computing resources like networks, servers, storage, applications and services that can be rapidly provisioned and released with the minimal management effort or service provided interaction".

Cloud Computing is broadly classified into three services namely: "Software as a Service", "Platform as a service" and "Infrastructure as a service".

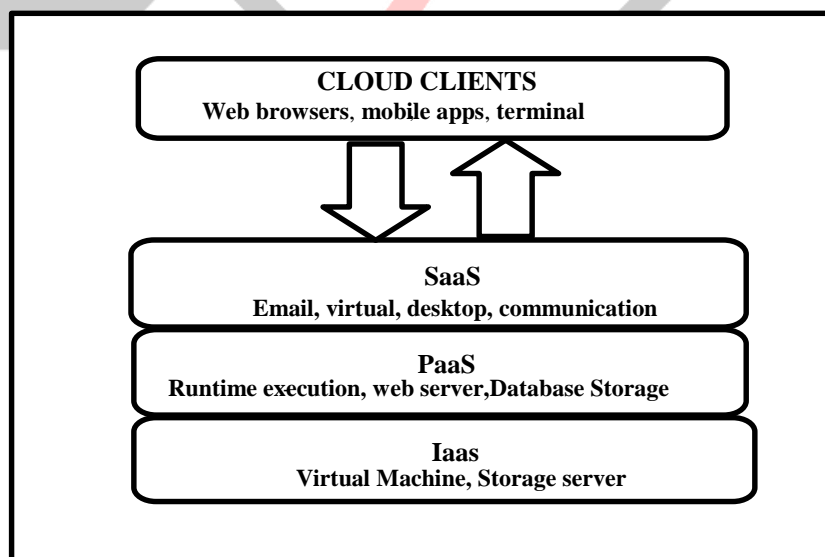


Fig. 1. Types of models in cloud

B. Compiler

Compiler is software that converts the source code into object code it convert the high-level language to low-level, machine level language. Compiler converts the source code, object code or assembly language into executable files. Following are classes of compiler.

1. *Native Code Compiler:* This compiler costumed to compile a source code for identical type of platform only.
2. *Cross Compiler:* The Cross compiler is mainly used to compile the object code for the different type of platform.
3. *Source to source Compiler:* The compiler that proceeds high-level scripts as input and output source script of another high-level.

II. MOTIVATION

In today's world, everything is on web. Everyone can use a services online, instead of storing data on hard disk. But still the organizations buys licensed software of compiler and it should be manually installed on every system. Some companies even buy the server and database to store the data. Due to this, project estimation cost of company increases. The project cost can be reduced with use of cloud and its services. There are many online complier available today but none of those give storage facilities. They can convert the code from one programming language to another but the code converter for widely used programming languages such as python, R language, Perl etc. are not available online. In this research work, we proposed an approach of online compiler which allows user to compile their code online and to store their code. They can also create, save, open, update, delete, their source code and compile code. The proposed approach transforms source code from a higher level language to a lower, machine level language. This is preferably done in order to create executable files which can then be run in order to execute the program and its instructions. The users can even convert the source code from one programming language into another.

III. RELATED STUDY

We discovered the literature of the following research papers related to online compiler of various languages and are described below.

3.1 SCIENCE OF COMPUTER PROGRAMMING:

The author Nico Krebs and Lothar Schmitz [1] the major constraints of this research paper is on the internal behavior of the compiler. A compiler focuses on translating source code to machine code. The theoretical background of compiler theory is notoriously hard to understand. Conventional compiler writing tools set such as well-known Lex/Yacc combination are efficient to use. Even though the source code is free of syntax errors and compiler is generated successfully, it may still not do what is expected to do. Therefore, to find semantic errors test inputs must be prepared from the source code and after applying the compiler must be checked whether the generated target language meets the expectations. Various parsing techniques are used and debugging of code is done. A grammar editor is been introduced to avoid the typing mistakes. During the review of this paper we found some drawbacks as it is a simple offline compiler which is time consuming and also requires much space.

3.2 CLOUD BASED COMPILER:

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 ease. A cloud provides an agile development improves with the user's ability to re-provision technological infrastructure resources. API accessibility to software that enables machines to interact with cloud software in the same way the user interface facilities interaction between humans and computers. Compilers are used to run program and convert them from a text to executable form.

The author Sajid Abdulla, Srinivasan Iyer and Sanjay Kutty [2] introduces that a software would be provided to the end user using a SAAS cloud. It aims to create an online compiler which helps to reduce the problems of portability of storage and space by making use of concept of cloud computing. This provides a terminal to write a code and thus compile it using a private cloud. The errors and output of the compiled program can be stored in a convenient way. The software would contain a system that has a text editor and terminal. A web based application can be used to remotely through any network connection which is platform independent. The cloud based compiler mainly deals with providing a platform to compile and execute programs that is not dependent on any platform related restriction or complication. Security is provided by implementing a sandbox that is a security mechanism for separating running programs. It is often used to execute untested code, or untrusted programs from unverified third parties or websites. Only one language can be compiled here. It is not cost effective and needs internet connections.

3.3 COMPILERS ON CLOUD:

The author Ansari Mohd. Arshad, Khan Arshiya, Shaikh Sana and Mirza Zainab [3] deals with creation of Integrated Development Environment for different languages to code, compile and run the code using browser based IDE. Cloud computing introduces a major change in how we store information and run applications' user can compile and run the program and save it. Any authorized user can access their documents and applications from any computer over any Internet connection. Technologies used for this are .Net framework and MySQL. Framework provides safe execution of code, it can be used in websas well as window based

application. Database is used to store the information of the user that which code he compiles, runs and stores. A virtual machine is a software implementation of a computing environment in which a operating system can be installed and run. To run multiple operating systems was the original motivation for virtual machines. The proposed cloud based compiler can only convert the code of C language to C++, which is major constraints of this research work. In this approach virtual machine provides a complete system platform which supports the execution system platform which supports of a complete operating system.

As a private cloud is used it is been divided into 3 layers tools, drivers and core. The tools has several tools for managing the cloud through its interface. The virtual manager is the component which responsible for VM management. Virtualization breaks the link between hardware and the applications that run on it.

We found security and critical issue on developing the program compilation and running environment. A malicious code can harm the system.

3.4 ONLINE COMPLIER AS A CLOUD SERVICE:

The author Arjun Datta and Arnab Kumar Paul [4] focuses on solving the problem of storage and portability of compliers. A compiler transforms high level language to a lower machine level language. This compiler compiles program written in C, C++ and Java using SaaS. The user need not have a compiler installed in his system, he just has to submit the program to the user interface provided by either typing the code in the text box provided or uploading the file. The user will get the output after compilation. If compilation is not successful, the errors are shown else the output is displayed. The user will type the code on the interface and will get the output after compilation, he doesn't need to install any kind of compiler. The user interface is a web application hosted on the IIS Server which provides the user an interface to submit their programs. Guest users are the users who do not register with the system. They are provided with the functionality of writing the code using any mechanism and receiving their output after a certain amount of time. Registered user are those who register with the system. These users are provided with the certain added features which are not provided to the regular guest.

In this approach, as the number of user increase, the performance of web server degrades.

3.5 MULTI-LANGUAGE CLOUD BASED COMPILER:

The author Parag Chaudhari, Ritesh Manajaramkar, Akhilesh Kulkarni and Sarwe Vellaswami [6] focuses on compilers which executes various codes written in different languages. Compilers are used for executing various codes written in different languages from its text format to an executable file. These compilers have to be installed on machines using its setups depending on the language in which the code is written and also the platform on which it's running. In this a SaaS private cloud is used for storing various compilers of different languages at the server side.

Cloud provides platform where compilers for all languages are provided user just has to install compiler for particular language and execute the program. Compilers for C, C++, Java, Python and Pascal are provides by cloud. Collisions are handles by using scheduled parallel program allocation. Multiple requests can be handled.

It is a centralized compiler, everyone loves their work done in less number of penny, requiring less space and with no real latency. The authors have made this all possible for executing the codes of different languages parallel providing a centralized compiler along with saving the tedious work of installing different compilers on the physical machine with the complete operating system independence.

Developers of the product are aware that main feature of the intended product is portability. So they should use common libraries and tools that can work with all the common internet browser application without problem. User's security is also taken into consideration. This cloud based compiler mainly aims to provide a platform to compile and execute the code that is compatible with any platform with necessary constraints, assumptions and dependencies. Thus a cloud will be available where a server will be present which handles codes of users and will compile code.

3.6 ASTRONOMY AND COMPUTING:

The author J.Akeret, L.Gampera and A.Amara describes the new emerging Python programming language. It is a dynamic interpreted language, which requires an interpreter for the execution of a program. The performance of this is slower than C. therefore, the evaluation of numerical expression requires the interpreter to unbox every value and to load the appropriate operation, as operators can be overwritten dynamically. In order to combine the ease of Python and speed of C++ HOPE is developed, a specialized just-in-time compiler is designed. It converts Python source code into C++ and compiles the generated code at runtime. In contrast to other existing JIT compilers, which are designed for general purpose. HOPE can achieve very high performance for these applications. In cache verification HOPE checks if a compiled version of the requested functions has previously been cached. In case the code is executed the first time, HOPE returns a wrapper function containing a reference to the original function. It translates the unary, binary and comparison operators. Python just-in time compiler are able to apply numerical optimization to mathematical expressions during compilation process. The major problem in this research works is, it is time consuming. And if solution are intrusive then it may require the user to change the code.

3.7 A CLOUD BASED JAVA COMPILER FOR SMART DEVICES:

The author Nishant Rao and Ketan Ketu [7] gives a Java compiler for smart devices. Smart devices have become popular among university learners. The objective of this research work is to provide a streaming service of user's own multimedia contents on smart phone at anytime and anywhere. Cloud mobile provides management and streaming service for user's multimedia contents using local storage in user's smart phone, user's personal NAS, user's cloud storage and cloud centric media network and media analytics. Cloud resource management and control in Infrastructure-as-a-service and cloud based system and application in software-as-a-service. The number of smart phone and mobile application are growing rapidly. Load balancing algorithm and

Greedy method algorithm are used to compile and execute Java programs directly through the Android mobile so that they can concentrate on the programming concepts rather than learning new OS. It provides open development platform thus it offers developers the ability to build extremely rich and innovative application.

A compiler of Java is provided for smart device where user can write code and execute it on their smart device. This reduces time and efforts to install compiler. This type of compiler only supports Java language.

3.8 ONLINE JAVA COMPILER WITH SECURITY EDITOR:

The author Shubham Chourasiya, Sneha Gadhave, Tushar Bhatt and Renuka Kulthe [8] focuses on online java compiler with editor. A Java program is written and rectified using the compiler. If a user doesn't have Java Development Kit then is connected to the server having security editor which encodes and decrypts the file. MD5 algorithm is been used for providing security editor. This is developed for compiling the java program. Online which provides java API. The main aim is to simply write a program and compile and debug it online. A module will produce a java file and put it aside in our native classification system. Encryption is done using MD5 Algorithm. A user provides binary number and with this binary numbers a file is encrypted. Thus the actual text of the file is converted to a cipher text and is made visible to the user. Decryption is done using MD5 Algorithm. The binary numbers are decrypted and actual text to an original text and made visible to the user.

3.9 ONLINE COMPILER WITH PLAGIARISM CHECKER:

The author Aarthi G.V, Abhishek Rajagopal and Mukundhan Lakshmanan develops software as a service like online compiler with plagiarism checker. SaaS access the scalable IT services and computing resources, they use the public cloud resource to create a virtual cloud. Software as a service oriented architecture where the application can easily communicate with them. The features of SaaS are Reusability, Quality a Service, Data Security, Multitenant, Configurability and Availability. The system design includes Registration in which each user has separate login id and the code is saved in the databases. Making and deleting project codes into the database is done efficiently. The code is saved in the cloud database but the program is run in the client side. The debugging mechanism will clear the errors in the code. The plagiarism checker is runs after the debugging of the program the main objective is to compile the centralized mechanism. The codes are stored in the database. A cloud compiler cum interpreter executes codes in the client side. The main advantage is of the compiler is light of Web administration is mixing with one another. Bag of codes is used to relate the programs in the cloud and string matching is done for plagiarism detection. Plagiarism is done after debugging of the code. This cloud compiler will eliminate installation of other compilers.

IV. SYSTEM DIAGRAM:

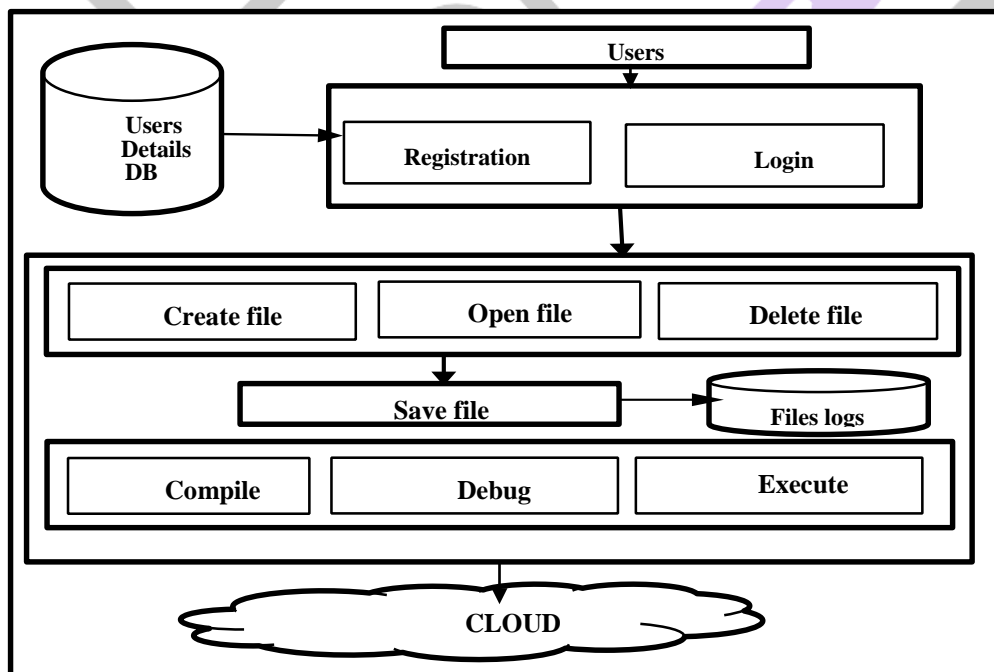


Fig. 2. System design of Online Compiler

V. ANALYSIS:

5.1. RESEARCH GAP:

1. Some of the compilers that we have studied are simple and offline which may need more time and space.
2. In some compilers only one language is been compiled which may not be cost effective.

3. In offline compilers security can be found as an issues which may give a trouble in compiling programs.
4. The compilers for smart devices includes only one language Java for compiling programs.
5. The ability to convert the code of one language to multiple language.
6. All the studied compilers are not much user friendly so there is a need to provide a system which may be compatible for users to use.

5.2 COMPARATIVE ANALYSIS:

Table no1 gives comparative analysis of various online compilers which we have studied by considering various query type such as which languages are compiled by all studied compiler. Services used for constructing different compilers using of cloud. Services used for constructing different compilers using of cloud. The storage facilities provided by cloud. The efficiency of all compilers by considering factors such as total time consumption, accuracy, Performance, security etc.

Proposal	Language Compiler				Cloud Services used		Storage Provided	Performance	Execution Speed	Security	Architecture/ Approach/ Algorithm Used
	C	C++	Java	Python	SaaS	PaaS					
SAJ 13	N	Y	Y	N	Y	N	Y	M	H	H	Service Oriented Architecture
ANA 13	Y	Y	Y	N	Y	N	Y	M	M	L	Integrated Development Environment (IDE)
ARJ 14	Y	Y	Y	N	Y	N	N	H	H	L	Multithread approach
PAR 15	Y	Y	Y	Y	Y	N	Y	M	H	H	Service Oriented architecture
SHU 17	N	N	Y	N	NA	NA	N	M	M	H	MD5 Algorithm
AAR 18	N	N	Y	N	Y	N	Y	M	H	H	Service Oriented architecture

How to read table, in proposal are the given reference, and N represents no whereas Y represents Yes and H, M, L for high, medium, low respectively.

TABLE NO: 1. COMPARATIVE ANALYSIS OF ALL ONLINE COMPILER

VI. CONCLUSION

Thus by referring all the papers we came to the conclusion that there are many compilers those compile various programming language code into other but only one language is been compiled to another. Some of them requires centralized compiling scheme. Every Compiler is needed to be installed on the individual system in order to compile the code. Which results into wastage of memory. Few Compiler we studied are online but can compile only one particular programming language. Thus we proposed a smart hybrid compiler which are compile multiple language on a one platform and even can convert code one language into another language.

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