

Cloud Compilers

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Abstract- Cloud Computing is an Internet based computing environment where resources like computation power, storage, development environments, software's are provided to consumers on demand. Different programming languages require different compilers for compilation hence there is a need to have different compilers on the same machine. The tedious process of setting up different environments on the machine can be overcome by using cloud compilers. In today's scenario many cloud based compilers are available but they have certain limitations like they don't provide the hardware based infrastructure to compile and execute programs on specific computing devices such as NVIDIA GPU etc. This paper aims at creating a system using a cloud based service i.e. PAAS(Platform As a Service) which will be allow users to write, edit, compile and run programs. On the cloud, we intend to use the hardware such as NVIDIA GPU CARD. The overall system can be used to reduce the hardware cost and minimize management efforts to maintain the system.

Index Terms- Online compiler, Compiler, PaaS, Cloud Computing, Browser Based IDEs.

I. INTRODUCTION

The term Cloud Computing refers computing paradigm using virtual private network (VPN) services. In which dynamic, reliable, and cost effective with a guaranteed quality of services are provided. Many applications can be executed dynamically to meet user needs. Cloud Computing includes service oriented architecture (SOA) and virtual applications which is based on both hardware and software. Servers in the cloud can be physical machines or virtual machines. The applications of Cloud Computing are practically limitless. End user typically locates different hardware architecture, storage capacity, network connectivity and so on using Cloud Computing. This allows efficient computing by centralizing storage, memory, high performance computing, bandwidth, etc. without knowledge of the end users.

Three types of services are available in cloud computing:

- SaaS (Software as a Service).
- PaaS (Platform as a Service).
- IaaS (Infrastructure as a Service).

➤ SaaS SaaS provides an application on the basis of users

requirement. It is a type of model for software deployment

in which an application is hosted as a service provided to the user across the network. There is no need to install and run the application on the users own computer. User not require to purchase resources only require to pay for what he/she uses during a particular session. SaaS helps users by reducing burden of software maintenance and support. CRM, E-mail, Games, Virtual Desktop are the examples of SaaS.

➤ PaaS The idea of PaaS is that some users can provide

the specific hardware and a certain amount of application

software as a foundation by which other users can build their applications. This service is termed as an integrated solution over the cloud. User need not to bother about the internal architecture of machine, operating system usage and so on. Database, Web Servers, Deployment tools and environment are the examples of

PaaS.

➤ IaaS It includes computing control and storage. Cloud

infrastructure is a cost effective model for delivering distinguished services like reducing hardware maintenance

complexity, real time workload balancing, etc. Instead of servers, software, data centric space or network equipment user cloud can buy those resources as a fully outsourced services. Virtual machine, Servers Storage, Networks are the examples of IaaS. Amazon Web Services

(AWS) is one of the pioneers of such an offering.

[1]

➤ QEMU:

QEMU is a machine emulator. QEMU stands Quick Emulator. it can run an unmodified target operating system (such as Windows or Linux) and all its applications in a virtual machine. QEMU itself runs on several host operating systems such as Linux, Windows and Mac OS X. The host and target CPUs can be different. The primary usage of QEMU is to run one operating system on another, such as Windows on Linux or Linux on Windows. Another usage is debugging because the virtual

machine can be easily stopped, and its state can be inspected, saved and restored. Moreover, embedded devices can be simulated by adding new machine descriptions and new emulated devices. The dynamic translator performs a runtime conversion of the target CPU instructions into the host instruction set. The resulting binary code is stored in a translation cache so that it can be reused. The advantage compared to an interpreter is that the target instructions are fetched and decoded only once. Usually dynamic translators are difficult to port from one host to another because the whole code generator must be rewritten. It represents about the same amount of work as adding a new target to a C compiler. QEMU is much simpler because it just concatenates pieces of machine code generated off line by the GNU C Compiler [2]

1. Centralized compiler

The paper aims to describe cloud compiler which reduces the problems of time, cost and storage space. Also, the issues of installing the compiler as well as hardware on each computer is avoided. The main reason for creating the project is to provide a centralized compiling scheme for hardware dependent languages like nvcc cuda. The other advantage is this system will make the users system lightweight i.e. there will be no need to maintain separate compilers at the client side. Also, the process of maintenance of user credentials will be greatly simplified. Also, authentication and personalized task distribution will be made possible. A compiler is the heart of any computing system which transforms source code from higher level language to lower level language. This is done in order to create executable files which can run to execute the program and its instructions.

2. Related work:

- **Online C/C++ compiler using cloud computing:**

OCC is an online compiler cum interpreter and a simple collaboration. it is a pastebin that executes code for the user. The overhead of downloading and upgrading several compilers at several times may be avoided for users and it helps to analyze multiple compilers which may be easy to use. Using software as a service can provide compilers such as C and C++. It offers online help, debug program and error messages for user convenience.

- **Online JAVA compiler using cloud computing:**

Technology is used to generate online java compiler using Cloud Computing in 3 tier architecture.

1. Data Layer (Back End): Available in the Web Server containing account information about the user.

2. Business Layer (Middle End) : Decision regarding application layer is done in this layer.

3. Application Layer (Front End) : This layer provides a user interface which gives output to user and gets desired input from the user.

4. Compile Option : It requires code in the text box to the server side for its compilation. At the server side the compiler package gets imported.

5. Execute Option : The user gets all the executable files that were present in his folder and was already compiled at least once without errors.

II. LITERATURE SURVEY

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks to provide dynamically scalable infrastructure for application, data and file storage. It is a technology that uses the internet and central remote servers to maintain data and applications. Developers often have applications locally installed on their computers to run and edit programming code but online IDE is more accessible and lets you work in the same application you surf the Internet on your web browser. In this paper we are offering open source web-based IDE for executing code online so that multiple users can work online on same document. We will be implementing online execution of multiple programming languages where the compiler will use the processing and memory resources of cloud. The IDE can handle multiple projects and it helps developers to save data and development processes in a remote server. [3]

Cloud computing provides a way of taking applications online and all these applications and their associated data can be accessed with just an Internet connection and a web browser. Like many other software's and applications an Integrated Development Environment (IDE) can also be hosted on the cloud. This paper conveys the details of the implementation of a cloud based IDE for the C,C++,Java, CUDA. This browser based IDE empowers the users to write, compile and run their code using various devices like smart phones, laptops or desktops that allow Internet access. This IDE is implemented to accommodate sharing of projects and files among users. It also supports the feature of real time collaboration with peers by which two or more people who have access to the same file can modify it at the same time and ensure that the changes are reflected to the others in real time. This IDE also provides users with the facility to download files so as to keep a copy of them on the users local machine. This IDE integrates forums and blogs. Users who require instant help related to coding can make use of the integrated forum to post their queries and who wish to share their knowledge can post on the

integrated technical blog. This IDE provides a lot of features under one single roof that the users can utilize even on-the-go with their mobile devices that have Internet access like laptops or smart phones. This IDE eliminates the need to download any software or desktop IDE because this application is present on the cloud and it also permits people working under various heterogeneous environments to code and collaborate and share knowledge with ease. [3]

The basic underlying architecture for deployment of cloud compiler is to establish a private cloud under linux environment which provides hosted services to a limited number of people and distributed in the heterogeneous manner. Private cloud make the cloud infrastructure based on Ubuntu Enterprise Cloud (UEC) scalable as per the requirement and our cloud compiler allows a programmer to pick up the fastest or the most convenient tool to compile the code and remove the errors. Also the performance analysis and the experimental results shows that the performance of cloud compiler is more efficient as compared to all other normal compiler hence proposed cloud compiler is considered to be the best performers among the various compilers. With SaaS, a single application is delivered to thousands of users from the vendors

servers. Customers don't pay for owning the software rather they pay for using it. The recent upswing in technology and increasing concern related to portability, compatibility, storage space, performance caused a boost in providing an efficient cloud compiler for languages like C,C++, PHP, Perl, Ruby, Python based on cloud computing. [4]

QEMU, a fast machine emulator using an original portable dynamic translator. It emulates several CPUs (x86, PowerPC, ARM and Sparc) on several hosts (x86, PowerPC, ARM, Sparc, Alpha and MIPS). QEMU supports full system emulation in which a complete and unmodified operating systems run in a virtual machine and Linux user mode emulation where a Linux process compiled for one target CPU can be run on another CPU. QEMU has reached the point where it is usable in everyday work, in particular for the emulation of commercial x86 OS such as Windows. The PowerPC target is close to launch Mac

OS X and the Sparc one beginsto launch Linux. No other dynamic translator to date has supported so many targets on so many hosts, mainly because the porting complexity was underestimated. The QEMU approach seems a good compromise between performance and complexity. [2]

• **Comparison table of different websites:**

no	Web sites	URL	Need Login to use	Need Pay to use
1	Compilr	compilr.com	Yes	Yes, free 14 days, then , Pay: \$10 or \$20/mth.
2	Codiad	codiad.com	No	No : open source
3	Cloud9	c9.io	Yes	No
4	CodeEnvy	codevy.com	Yes	No
5	CompileOnline	compileonline.com	Yes	No: Open source
6	IDEOne	IDEOne.com	No	No
7	ShiftEdit	shiftedit.net	Yes	No
8	CodeRun	coderrun.com	No	No

III. MOTIVATION:

Web sites	Cuda	Other languages	Syntax highlights	File manager
Compilr	No	Many	Yes	Yes
Codiad	No	40+	Yes	No
Cloud9	No	Jss , css , php	Yes	No
CodeEnvy	No	Jss , css , php	Yes	No
CompileOnline	No	Many	Yes	Yes
IDEOne	No	40+	Yes	Yes
ShiftEdit	No	20+	Yes	Yes
CodeRun	No	7	Yes	No

In standalone machine we need to install the compilers and necessary hardware. This derive us an

idea to design a system. Many times we work on the machine and forget to maintain soft copy with us. So

system will be consistent enough that maintain the previous work with login credentials. the idea of web based IDE to code in the cloud and also it provide the special feature of real time collaboration. But using this IDE without installing any compilers user can

directly execute program. Also, with various devices like desktops, laptops and smart phones it can be accessed from anywhere, anytime with an internet connection.

IV. PROPOSED SYSTEM

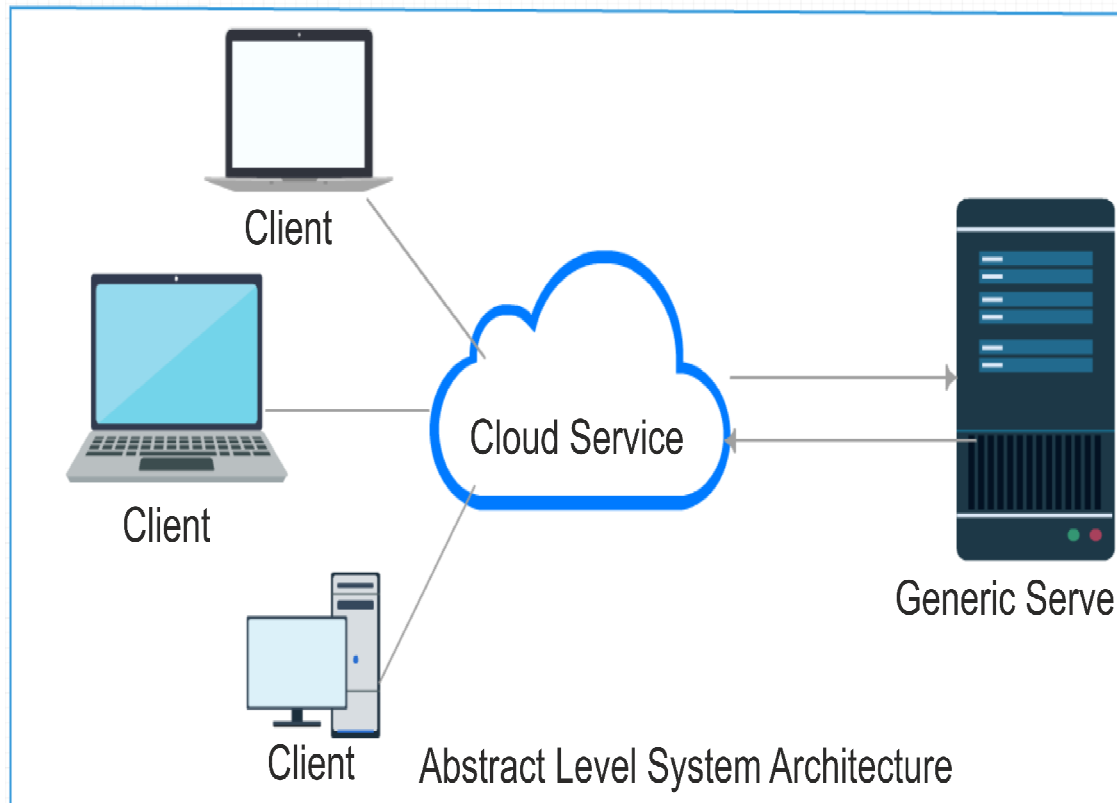


Fig. 1. Architecture

Above figure illustrate the abstract view of the proposed system. Integrated Development Environment (IDE) is accessible from various devices like desktops, laptops, and smart phones with an internet connection. This paper explains the implementation details of the web based IDE which is present on the cloud and which support execution of programs in various languages. As the application is deployed on the cloud there is no need to install and download it on individual machine and because of this most of the operating system issues or hardware compatibility issues are eliminated. Application can be accessed in real world from any device with an internet connection. In this application we are using cloud based compilers. We deployed the application on cloud so that users can directly execute programs using this application without installing any compilers on their personal Computers. This IDE supports execution of C, C++,JAVA, NVCC programs. The special feature of this web based IDE is that it supports real time collaboration. User can write code for our application and after execution of code output

will be display on same window. The files or data can be saved on cloud so that the users can easily get their data from anywhere using this application.

V. SYSTEM ARCHITECTURE :

The given figure illustrates the flow of our entire system. The whole system is divided into two parts viz., Client End and Server End.

A. Client End : At client end the basic requirement is network connectivity and JS supporting web browser. The client computer is act as a dumb terminal for the system. The webpage contains the HTML+PHP+JS. At client end user will write program ,select respective compiler and see its output.

1. HTML is used to display the content on the browser, Accepting the login credentials, Writing the code, Displaying the output, etc. are the activities done using the Html.

2. JS is JavaScript language is used to reduce the work load on the server. As the JavaScript is popular among the web development because of client side language. So most of the work is done on the Client

side only. IDE developed in JavaScript is helpful for reducing the load on server side. As the most of the task such as Create, Edit , Delete program, Spell checking, Syntax Highlighting, Showing Line number, etc. will be done on client end only. Managing the project work file is tedious job, these can be done by using Virtual File Manager in JS which manage files in a Hierarchical structure as most of the IDE provides.

3. Php is a server end scripting language used to write business logic, connectivity among various servers and maintain the consistent and secure system. Php is strong enough to handle excess workload on server as compare to other server side language. Dynamic programming make Php popular among the developers. The basic connectivity among the client and server is done by Php. Task like Maintaining the user credential with database server, file management with file server etc. task can be done by using Php language.

B. Server End: The heart of cloud system is Server. The main server handle the client side request. Server end contain different type of server for respective services of client.

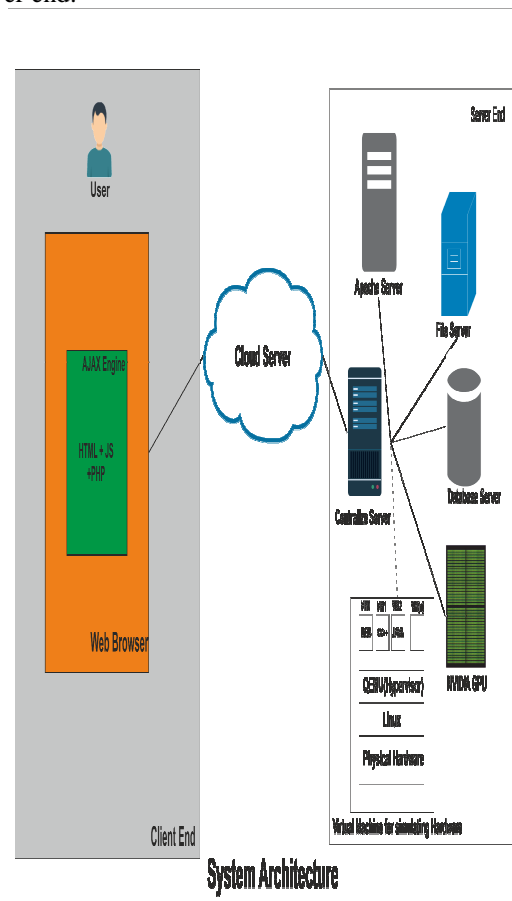
1. User credential, authority is maintain by the database server. This holds the information of client users such as username, password, basic details and access permission etc.

2. Project files are manage by File server. File permissions are monitor by the file server. It maintains the consistency among the project files.

3. Apache server is used to run the Php script on server end. It maintain the access permissions among different group of users. Maintaining the user sessions is tedious job done by this server to maintain the system consistent and secure.

4. Cloud computing consist of virtualization. Simulating the different types of processor is done with the Hypervisor.

5. Compilers which needs a hardware support for those compilers hardware should be installed at server side. NVCC required NVIDIA GPU for compilation of code so that it must be install and configured at server end.



VI. CONCLUSIONS

Cloud computing is a new way to consume new IT services, we can be much more flexible and productive in utilizing dynamically allocated resources to create and to operate. Cloud will continue to evolve as the foundation for the future Internet where we will be interconnected in a web of content and services. In this paper, we first discuss models of cloud computing, Hypervisors, JS based IDEs and Online compilers. There are several online compilers are available but the compilers which needs hardware support is major issue among them. This paper will provide a better solution for various online compilers which needs hardware support and pave the way further research in this area.

VII. ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on “Cloud Compilers”.

We would like to take this opportunity to thank our internal guide Prof. V. A. Meshram for giving us all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.

We are also grateful to Dr. Sachin Sakhare, Head of Computer Engineering Department, Vishwakarma Institute Of Information Technology for his indispensable support, suggestions.

In the end our special thanks to Prof. V. A. Meshram for providing varies resources such as laboratory with all needed software platforms, continuous internet connection, for our project.

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