An Overview of Open Source Cloud Computing

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Abstract: Nowadays, Cloud Computing becomes the most powerful tool to deliver data over the internet. Just by using web based tools data can be accessed anywher , any time. But because of the Proprietary Services it is also having some restrictions. This encourages developers to modify it, and create an open source cloud computing platform, which is none other than Open source Cloud Computing. It posses properties of both open source and cloud computing. This open source approach gives new meaning and new capability to Cloud Computing. This paper is the Overview of Open Source Cloud Computing having description of its significance and applicability with the help of some examples.

Keywords: Cloud Computing, Open Source Software, Eucalyptus, OpenStack, Nimbus.

I. INTRODUCTION

A. Cloud Computing

Cloud Computing is the model that provides on-demand network access to a large pool of systems which are connected in either public or private , and in which resources are retrieved from the internet without actual connection to the server.

To overcome the issues like Redundancy, Efficiency, Utilization and management, the concept of Cloud Computing is used. In Cloud Computing a large number of systems are connected to each other in private or public. To explain in brief while working with the internet, sometimes we have to store a data which is very necessary and can be needed at any time .then such a useful data needs to be store on cloud and for that "Cloud Computing" service is used.

There are many definitions according to various researches. For convenience here one of them is considered

According to Forrester Cloud Computing is

"A pool of abstracted, highly scalable and managed compute infrastructure capable of hosting end customer applications and billed by consumption". [2]

B. Different Clouds

Nowadays the term Cloud Computing is most commonly   used, because of the enhanced use of its applications like Mobile Cloud computing. Also Cloud Computing is becoming an important part of the industrial areas. In organizational level many types of clouds such as private, public, community and hybrid are used.

In **Public cloud** it includes the publically available cloud providers such as online photo storing services, email facility and also social networking site are some of the mostly popular example of the Cloud Computing.

Private clouds are limited to the particular organization only.

While **community cloud** allow the service to be shared by several organizations.

And **hybrid cloud** computing is the combination of both private and public.

C. Closed source and Open source cloud computing:

In the early days of Cloud Computing, closed source cloud computing is used. But due to some pitfalls in this approach such as security issues, open source cloud computing is introduced.

And nowadays open source cloud computing becomes more popular because of better costing.

1)   Software-as-a-Service(SaaS)

2)   Platform-as-a-Service(PaaS)

3)   Infrastructure-as-a-service(IaaS)

These service models with their examples are shown in the following figure.
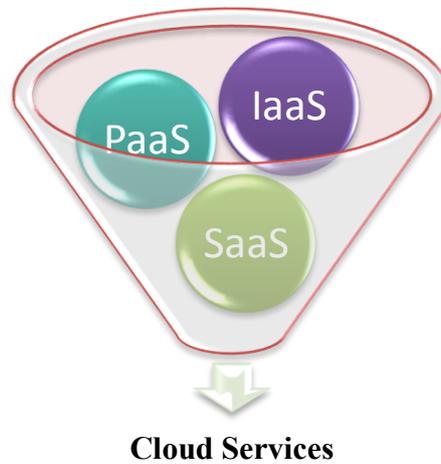
Cloud Services

Fig. 2: Services provided by the cloud [adapted from [3]].

1.   **Software-as-a service (SaaS):**This is the top most layer of the cloud computing stack. It is directly used by the end user. That means in SaaS consumer demands for the execution of some of the program. But in this client does not have any control over the application or infrastructure of the cloud. It is just allowed to use the provider's application that is running on the cloud environment.This can be achieved by using web-based tools and browser. Some examples of SaaS:Google Apps, Microsoft office 65, Salesforce.

2.   **Platform-as-a-Service(PaaS):**In PaaS consumer has its own freedom to build his own applications which run on the provider's infrastructure.[1]It provides carefree environment to developers. Paas offers platform for other's to use [9].When working with the PaaS developers need to focus only on language selection and coding as the required platform is provided by the cloud.

 Platform-as-a-service has several plus points[5]:

▪   Develop, test, deploy and maintain on the same integrated environment, which reduced development and maintenance costs;

▪   Users can experience the software online without downloading or installing;

▪   More closely integrated other online services and data;

▪   Built-in scalability, reliability and security;

▪   Improved the developer's cooperation;

▪   Understanding of user activity;

▪   Pricing based on actual usage.

Some Examples of PaaS: AWS Elastic Beanstalk , Google App Engine.

3. **Infrastructure-as-a-service (IaaS):** IaaS is very base layer of cloud stack. It is also known as the virtualization layer [7]. As the basic idea behind Iaas is virtualization. In Iaas all the components required to configure the infrastructure are provided.

The customer can choose his choice of storage, network bandwidth, memory, and other essential computing resources according to the need of his application. Client can buy such type of infrastructure whenever he wants.

Thus with the help of IaaS, customer just need to demand desired computing resources those he wants and reconfiguring them forms the infrastructure suitable for his application and ready for further use.

We can mention Characteristics of infrastructure as a service as [5]:

- It does delivery of all resources as a service.

- Lower total cost of ownership.

- Full scalability.

- Eliminate the need for administration

II. OPEN SOURCE SOFTWARE

Softwares like GNU Linux, My Sql, Apache web server, Mozilla web browser, open office etc. are the open source software.

Open Source software generally give preference to that program which is having source code available for others to use or modify other than that of original developers.[10]

As we know open source provides freely available source code to use and to modify as per developers need which gives tremendous freedom over close source having restrictions on using or duplicating the original source code without the permission of company. Due to this freedom facility provided by Open source software, they became popular, and are mostly used.

But beacause of this facility is provided, open source license is only condition which user has to fulfill.

III. open SOURCE WITH CLOUD COMPUTING

As widespread use of the open source softwares gives the idea to use this with the cloud computing. Open source and cloud computing walks together. OSS runs on the ground of cloud and cloud makes good use of OSS. This results in the Open Source Cloud Computing. And also OSS can be used with the different service models of the cloud computing such as OSS as SaaS, OPaaS.

Open Source Cloud Computing is a great combination of the cloud features such as lower service costs, economically affordable and having better resource sharing ability and the Open Source features such as making the source code fully available unlike to that of proprietary approach. That's Why Open Source Cloud computing is being popular among the developers as well as end users.[3,14,19]

Wherever Times is specified, Times Roman or Times New Roman may be used. If neither is available on your word processor, please use the font closest in appearance to Times. Avoid using bit-mapped fonts if possible. True-Type 1 or Open Type fonts are preferred. Please embed symbol fonts, as well, for math, etc.

IV. OPEN SOURCE CLOUD COMPUTING SOLUTIONS

As the huge growth of cloud computing and increasing value of open source cloud computing there are many solutions .

Some of them are taken for study.

Eucalyptus

The Eucalyptus [6, 8, 11] is actually stand for "Elastic Utility Computing architecture for Linking Your Program to Useful Systems."

Eucalyptus is an open source cloud computing which allows installation of private and hybrid cloud infrastructure and having framework as a service IaaS.

Eucalyptus is made up of following components.

- Node Controller (NC):

Function of Node Controller (NC) is execution of query to collect necessary information, controlling and providing this collected information to the Cluster Controller (CC).

- Cluster Controller (CC):

It is front end component which is written in C. And it uses information which is provided by NC to manage execution.

- Cloud Controller (CLC):

Cloud Controller is very important component of the eucalyptus, as it acts as an interface between user and cloud. It actually provides the way for user to get into the cloud. Its main task is network resource management, Scheduling, and authentication.

It carry out all these with the help of web services ,those are as Data, Resource and Interface.

- Storage Controller (SC):

As the name suggests Storage Controller it is used to store data. It is a data storage device that stores and accesses virtual machine images.

OpenNebula

Here we come to the most promising and finest solution for open source cloud computing is OpenNebula. Ignacio M. Liorente and Ruben S. Montero established OpenNebula as a research project in 2005, But its first public release of software in March -2008**.** [16]

It is designed to work with networking , plus storage solutions [6].

As OpenNebula is free open-source software it is having call for Apache License Version2.It is generally used with private cloud, But it can also be used with public and hybrid cloud under some satisfactory conditions. To build the public, private, hybrid infrastructure implementations, OpenNebula contribute itself to manage data center's virtual infrastructures. Because of this scalability feature it is easy for OpenNebula to deal with the different types of demands of end users. Similar to the clouds it can also work with Hypervisors like Xen, KM, and VMware. [4, 15,19]

Open Stack

OpenStack [16,17,18] is announced by NASA and Rackspace in July 2010. OpenStack framework is used for public and private clouds.

Due to OpenStack user can get the facility of scalability, flexibility and of course, being open source the ability to modify the code at one time. It's just like all in one package.

One big reason of the uniqueness of OpenStack is its Component feature which separates the abilities and makes it easier for user to adapt it. OpenStack is divided into many components but few of them are having the special significance. Those are given as:

- Nova : OpenStack Compute

  Used for controlling IaaS Clouds and enabling the scalable feature of the platform.

- Swift: OpenStack Storage.

  It is also called as object storage infrastructure, which is used for creating storage space that can store multiple petabytes of data [4].

- Glance: OpenStack imaging Service.

  Used to record, distribute and store images to the virtual ones.

  Other features like Quantum, keystone, Dashboard horizon also converged on OpenStack to enhance its potential.

Nimbus

Nimbus is another cloud computing Solution which having focus on providing cloud within Infrastructure-as-a-service.

According to Keahey, 2009 Nimbus is an open source solution, requiring license under Apache License. It gives the extra feature of Workspace Service [12] .

While talking about the cross platform experience sang Jin Lee[20] mention in his report t hat Nimbus has been designed on the ground of a multi-device and multi-platform operating environment.

Apache Virtual Computing Lab.

It is another open source cloud computing solution that enables the user for remote access over internet. It comes under SaaS Service. There are various universities using Apache VCL [13].

- George Mason University, using Apache VCL general purpose computing Laboratory.

- Georgia State University, Apache VCL, primary support students using SPSS and Similar Software.

- University of North Carolina, Apache VCL, general purpose Computing and also such type of labs are used at other NC university

V. CONCLUSION

In this paper the overall concept of "Open source cloud computing" is explored, from its need up to its usage. Open Source Cloud Computing becomes that part of corporate world that its appearance cannot be ignored at all. It shows its usability not just with huge projects but also with the mostly used day to day life software's. Due to the Scalability and flexibility feature provided by the open source software, Open Source Cloud Computing is easy and interesting to handle. Among the Solutions available for open source cloud computing some are studied to get the actual idea of the applicability. And from if we take a look to whole study it is clear that Open Cloud Computing is most promising enhancement of Cloud Computing ,yet it is having many scope to enhance not only its, but other applications potential, if is emerged. Hence open Source Cloud Computing seems to decorate the Technological world.

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