

CLOUD COMPUTING SOLUTIONS AND IMPLEMENTATION OF PRIVATE CLOUD

Animish Pavate

Assistant IT Manager,
B.E. Electrical, MBA IS (NMIMS)
IGateGlobalSolutions Pvt. Ltd, Mumbai, India

Aruna Pavate

Lecturer,
Computer Engineering,
St. Francis Institute of technology, Mumbai, India

Abstract: Cloud computing is becoming a possible computing solution for service area oriented computing. Several open-source cloud software solutions are available to support administrators, developers and users need to choose the best environment for them depending on their requirement. Open-source software offers a huge amount of customizability without licensing fees. As a result, open source software's are widely used for scheming cloud, private clouds and hybrid clouds are being built increasingly in the open source. In this paper, two set of experiments are studied. (1) Study of sixty most common used open-source software's to select the best-suited one for deployment and research development in the field of cloud computing. (2) Implementation of a private cloud.

Keywords: Cloud computing, open-source software, private cloud, IaaS, PaaS, SaaS;

I. INTRODUCTION

In the today's world of Information Technology, cloud computing become a most popular term in recent year. The word "cloud" was used by Google's CEO Eric Schmidt to describe the business model of as long as services across the internet in 2006. To state various ideas the term cloud was used as marketing term [1]. Cloud computing is a different type of technique which relies on sharing computing resources rather than having local servers or personal devices to handle applications. Classification of clouds is done as public, private and hybrid. Services of three types are offered by cloud providers are Platform as a Service (PaaS), Software as a Service (SaaS) and Infrastructure as a Service (IaaS) [2].

A. WHAT IS CLOUD COMPUTING?

CLOUD means Computing Location independent Online Utility that is available on-Demand which let users to access that are located in on local, remote and other Internet connected devices. It is one of the approaching IT industry murmured words- the users move their applications and data to the remote cloud so that they can have a simple and pervasive way of accessing. Clouds are categorized in two ways:

- 1.1 On the basis of location of cloud computing.
- 1.2 On the basis of type of services offered.

1.1 On the basis of location of the cloud:

On the basis of location clouds are classified as follows:

Private Cloud: These are allocated to a particular organization and are not divided among any specific firm. Private clouds have higher cost and security in comparison to public clouds. Advance types of private clouds are private clouds and externally hosted private clouds.

Public Cloud: In public cloud, at the vendor's premises the computing infrastructure is hosted by the traders of the cloud. The user has no clarity and control hosted by the computing framework. The computing foundation is shared between with some companies.

Hybrid Cloud: This type of clouds is cost-effective and scalable. When we combine the use of public and private clouds together it is called as hybrid cloud. This aims in minimizing change.

1.2 On the basis of service provided:

On the basis of service provided Cloud computing consists of three levels of offerings as shown in Figure 1:

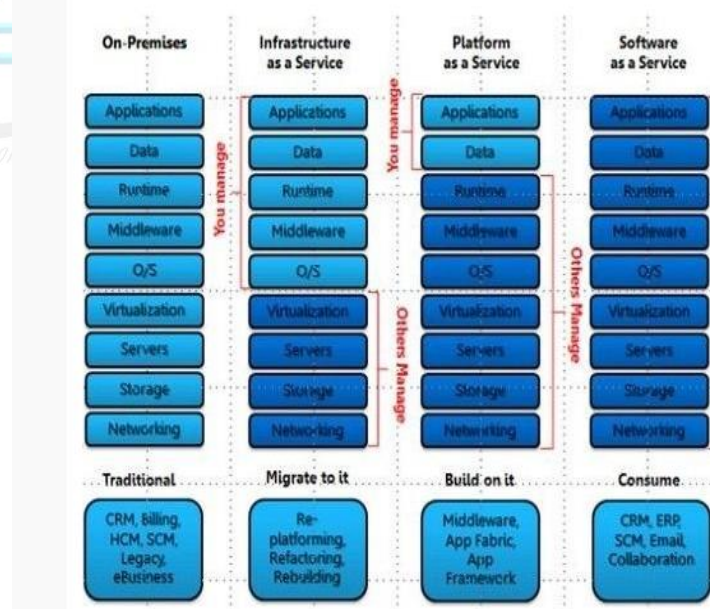


Figure 1: Cloud On the basis of service provided

Infrastructure as a Service (IaaS), where the equipment is provided in the form of virtual machines. The client maintains the applications, runtimes, integration SOA (Service Oriented Architecture), server system software, databases while the supplier maintains the Cloud virtualization, hardware server, storage, networks. Among the main actors of IaaS we find Amazon EC2, Rackspace, GoGrid. Using the principles of cloud computing services connected to hardware is presented. These include storage services or virtual servers.

Platform as a Service (PaaS), you can develop your own applications using the services provided. The client continues only those applications while the supplier maintains the hot Cloud, databases, server system software, Service Oriented Architecture integration, virtualization, server hardware and the storage networks. Development platform on the cloud is presented by them. Distinct Vendors deliver platform that are not consistent. Google Apps Engine, Windows Azure, Amazon these are some key players.

Software as a Service (SaaS), the entire applications are available remotely. Complete software services are offered on the cloud; among the providers we have Facebook, Google Apps, Salesforce.

Cloud Computing platforms provide easy accesses to a large pool of computing (and storage) resources through a variety of resources with virtual resource management [3]. Tools and technologies are emerging that can transform an organization existing computing infrastructure into a private or hybrid cloud [5]. Eucalyptus, CloudStack, OpenStack and OpenNebula are the most popular open-source cloud solutions used as to build such community cloud platforms. Eucalyptus is open source cloud software for building AWS-compatible private and hybrid clouds [5]. Apache CloudStack is open source software designed to deploy and manage large networks of virtual machines Infrastructure as a Service (IaaS) cloud computing platform [5]. OpenStack is a cloud operating system that controls large groups of compute, storage, and networking resources all the way through a datacenter, all succeeded through a dashboard that gives administrators control while empowering their users to provision resources through a web interface [7]. OpenNebula is an open-source cloud computing toolkit for managing heterogeneous distributed data center infrastructures. The OpenNebula manages a data center's virtual infrastructure to build hybrid, private and public cloud implementations of infrastructure as a service [8]. Cloud computing facilities are often supported by virtualization tools, which enable clouds to obtain or release computing resources on-demand and in a manner such that the losses of any component of the system will not cause system failure [9]. A wide range of visualization solutions have been deployed. KVM [10], Xen [10] and VMware [11] are the three most popular ones. The major share of cloud adopters plot to use only open-source based, or combination of open source and VMware based private cloud selections. Different cloud computing resolutions may also introduce different overhead for monitoring and managing the virtual resources [4]. Numerous contributions have been made by the open source community related to private-IaaS-cloud platforms. These open-source cloud management platforms and tools also have huge impact the adoption of cloud computing technology

II. CLOUD COMPUTING SOLUTIONS:

Cloud computing solutions [13] are listed as follows: Many open source tools are available on software as a service basis, and many others help enterprises set up Information as a service or Platform as a Service environments. Open source tools is a phrase used to mean a program -- or tool -- that performs a very precise task, in which the source code is willingly published for use and/or revision from its unique design, without any cost.

OpenStack

Numerous technology companies have announced their support for OpenStack, creating it the main open source cloud platform. It contracts data centers to group their access, storage, and networking resources and manages them through a support interface. This tool is Operating System Independent.

CloudStack

This is the Apache project offers a turnkey Infrastructure as a Service solution. CloudStack can be used by all cloud computing vendors and as well as by organizations running their own private clouds. This tool is Operating System independent.

OpenNebula

This project aims to simplify the process of setting up and running private or hybrid cloud locations. OpenNebula is fully an open source, but services and maintenance are accessible through C12G Labs, which grips the project. This is based on Linux operating system.

Eucalyptus

Eucalyptus stands for "Elastic Utility Computing Architecture, Linking Your Programs To Useful Systems," [12] Eucalyptus helps organizations to build private or hybrid cloud environments that are compatible with Amazon Web Services. Eucalyptus support is available on a expense basis. This tool is based on Linux operating system.

Synnefo

Synnefo is a complete cloud infrastructure stack built using KVM, OpenStack and Google Ganeti. There's a lot of information available on the network, so you can see the support in action before you download. This tool is based on Linux operating system.

Scalr

Used by companies like Expedia, Samsung, Oracle, GE, Nokia, Disney, CBS and Accenture. Scalr is an enterprise cloud management solution. This is available as open source version; also it comes in paid hosted or on-premise versions. This tool is used on Linux operating system.

FOSS-Cloud

This multi-faceted cloud computing solution includes cloud desktop, Software as a service, Infrastructure as a service and Platform as a service and virtualization capabilities. According to the information available, it can save users up to 40 percent compared to closed source virtualization software. This tool works with the operating System like Windows and Linux.

OpenQRM

This is an enterprise-class tool which combines datacenter controlling, system administration and Infrastructure as a service provisioning into a specific tool. It improves up both a free community version and a paid enterprise version. This tool is based on Linux operating system.

Desein

This tool is sponsored by Dell; Desein describes itself as an "Open Source cloud abstraction library for Java." It is a model for which gives Infrastructure as a service and Platform as a service assistance that enables applications to run in any

cloud environment. This tool is used on Linux operating system.

CLOUD DESKTOP

eyeOS

Now days its commercial software available from IBM and other partners, you can still right to use the mature version, which is open source versions of cloud desktop solution. It arrogates to be the major and the most popular open source cloud desktop. This tool is based on Linux operating system.

Oneye

A community group is ongoingimprovement of the open source version of eyeOS, which they have pronged under the term Oneye. It is currently offered with version 0.9, and only community provision is available.

OwnCloud

As from the name itself, this toolpermits individual users to set up their own personal cloud so they can access theirindividual resources like email, files, and multimedia content from any device. If you do not have your own private server, the website relates to a number of service providers who offer hosting. This tool works with the operating systems like Windows and Linux.

HYPERVISORS TOOLS

Xen

This tool is funded by the Linux Foundation;Xen has been merged into several other open source projects, including CloudStack, OpenNebula,Eucalyptus, Apache and OpenStack. Amazon initiated using it for its cloud computing examination in 2006, and it also runs many other public clouds. This hypervisor is operating system independent.

KVM

KVM is a Red Hat emerging technology mission, KVM is a virtualization solution for x86 systems. It's been portion of the Linux kernel since 2007. This tool works with both the operating SystemLinux and Network Monitoring tools.

Opsview

This is a monitoring tool which allows IT authorities to keep checks on their cloud, virtual and physical systems. It comes in core (open source), professional, enterprise and MSP versions. This tool is based on Linux operating system. This provides facility Platform as a Service.

AppScale

This tool is based on Google App Engine. AppScale is an open source. This provides platform as a service solution. Paid support is also available. This tool is based on Linux operating system.

OpenShift

OpenShift is an owned by RedHat, OpenShift is provides both downloadable software that allows organizations to set up their own PaaS service and an online public PaaS. It supports technologies like Node.js, Python, Perl, Java, PHP,

RubyMySQL, MongoDB, PostgreSQL and Jenkins. This tool is based on Linux operating system.

Cloud Foundry

This tool is owned by Cloud Foundry counts Verizon, Pivotal, SAP and Baiduamongst its users. This is an open source project in addition, Pivotal also offers Pivotal Web Services, a public PaaS based on Cloud Foundry, and Pivotal CF, a supported version of Cloud Foundry that enterprises can practice to set up a private PaaS. This tool is based on Linux operating system.

BACKUP TOOLS

Amanda/Zmanda

Amanda, full forms "Advanced Maryland Automatic Network Disk Archiver," arrogates to be the "most popular open source tool used for backup and recovery software in the world." Zmanda sponsors development of the tool. Zmanda offers cloud-based backup based on the same software. This tool is supports Windows operating system, Linux , OS X and BSD.

Bacula

This tool is designed basically for enterprise use. Bacula also lays claim to the "most popular" title. Bacula Systems provides paid support and services, including "Bacula for the Cloud." This supports Windows operating system, Linux, OS X.

BIG DATA TOOLS

Hadoop

Hadooplets organizations to route large data sets quickly across clusters of distributed systems, in a cloud computing environments. It is used by many of the famous organizations on the Web, including Yahoo, Alibaba, Ebay, Facebook, Adobe, AOL, FOX, Google, Hulu, LinkedIn, StumbleUpon, The New York Times, Spotify, and Twitter.This supports Windows operating system, Linux, OS X.

GridGain

GridGrain practices in-memory computing to boost performance for distributed processing. It is frequently used in the cloud and alongside other big data tools like Hadoop. This supports Windows operating system, Linux, OS X.

BUSINESS INTELLIGENCE TOOLS

Jaspersoft

This tool is recently acquired by TIBCO, Jaspersoft which offers both type of versions paid and free open source of its highly popular analytics software. It provides cloud analytics service starts at just \$1/hour. This tool is operating system independent.

OpenI

OpenIattempts to support an enterprises go from "data to insights in 72 hours with open source." It is a reporting tool that incorporates with other open source BI solutions and can

be deployed to Amazon Web Services very easily. This tool is operating system independent.

BUSINESS PROCESS MANAGEMENT TOOLS

ProcessMaker

This is an open source business process management tool counts Toyota and Lenovo among its users. In addition to on-premise versions, it is available in a cloud version with several different rating tiers. This supports Windows operating system, Linux and Content Management.

Alfresco

This is just like Alfresco offers collaboration, Microsoft SharePoint, document management and media management capabilities. This tool also comes in both free and paid on-premise cloud versions. Operating System supported by this tool Windows, Linux and OS X.

MindTouch

This tool allows enterprises to set up self-service and knowledge-based websites where their clients can quickly find information what they need. The cloud-based version is at present the primary version of the software, but we can still take the open source MindTouch Core from SourceForge. This supports Windows operating system and Linux

CUSTOMER RELATIONSHIP MANAGEMENT (CRM) TOOLS

SugarCRM

SugarCRM claims millions of users at companies around the world. This tool also comes in both paid version and free version. The cloud-based paid version has three different pricing tiers. Community version can be freely downloaded. Operating System supported by this tool Windows, Linux and OS X.

vTiger

vTiger assertions a low total cost of ownership, whether you use the paid cloud-based version or the free open source download. It comprises document management, inventory management, reporting, email marketing, project management, calendar, task management, and other capabilities. Operating System supported by this tool Windows, Linux, iOS, Android.

Orange Leap/MPX

The purpose of most of the CRM tools are to build with for-profit companies keeping in mind, Orange Leap was prepared for non-profits. This tool is available in both paid, cloud-based version. You can download the open source version from GitHub. This tool supports only windows operating system.

SplendidCRM

This is CRM cloud based tool. The latest features in this CRM package include Twitter integration, undelete, and Twilio, an HTML5 calendar and many more. It is available in three editions—community (free and open source), professional and enterprise—all of which can be accessed in the cloud or deployed on premise. This tool supports only windows operating system.

DATABASE TOOLS

Riak

This tool supports distributed databases in cloud environment. This distributed database offers fault tolerance, operational simplicity, high availability and scalability. In addition to the open source version, it supports enterprise version and a Cloud Storage (CS) version that is perfect for cloud computing environments. This supports Linux operating system.

DOCUMENT MANAGEMENT SYSTEMS (DMS)

OpenKM

The Web-based OpenKM is a full-featured document management system with version control and file history, scanning, workflow, search, metadata, and similar capabilities. It comes in three different versions: the free open source edition, the supported professional version and the subscription-based cloud version. This tool is operating system independent.

LogicalDOC

This is a cross-platform document management system that goals to make the paperless office a reality. This tool is also available in three different versions. It's available in community, business and enterprise editions. The enterprise version can also be purchased on an SaaS basis. This tool is operating system independent.

OpenDocMan

This tool is designed to abide by ISO 17025 and OIE standards for document management. This offers features like robust user management, easy setup, change tracking, search, robust security and support for multiple languages. In addition to the free download, it's also available as a hosted service, and cloud-based backup can be purchased for an extra fee. This tool is operating system independent.

E-COMMERCE TOOLS

Magento

This tool is used by more than 200,000 online stores, eBay's Vizio, Homedics Magento platform counts. The North Face, Office Max and many small businesses among its users. "Magento Go" is the title for its hosted solution, which is accessible free for 30 days and starts at just \$15 per month. Operating System supported by this tool Windows, Linux and OS X.

Fishop.NET

This is "no frills" e-commerce solution deals a live online demo so you can see it in action before you download it. A hosted version is accessible through its partner Arvixe. This tool support windows operating system.

E-MAIL/COLLABORATION/GROUPWARE TOOLS

Collabtive

Collabtive is web-based project management. This tool is easy and efficient for projects. Key features include Projects, Milestones, Tasks; File Management; Time tracking etc. Basecamp users find this cloud-based project management

system very familiar. Basecamp is an online project management tool from web design firm. Organizations can host collaborative on their own servers or promise to the hosted service, which has three pricing tiers: freelancer, studio and enterprise. This tool is operating system independent.

Group-Office

Group-Office is an enterprise CRM and groupware tool. This tool Share projects, calendars, files and e-mail online with co-workers and clients. This is easy to use and fully customizable. This enterprise-class groupware and CRM solution derives in a free community version or a paid professional version that enhances helpdesk, time tracking, mobile sync, project management and document editing. Cloud-based hosting surprises at 10 euros per month and promises 99.99% uptime. This tool is operating system independent.

Zimbra

Zimbra Collaboration is an open, secure collaboration tool for email, calendaring, tasks address book and file sharing solution and more that is similar to Microsoft Exchange/Outlook. This tool is used by many companies like Comcast, Dell, Rackspace, Red Hat, Mozilla, Titleist and H&R Block. This tool was "built for the cloud, both public and private." Operating System supported by this tool Unix, Linux and OS X.

Cyn.In

Cyn.in defines as "the first open source collaborative knowledge management appliance." It is available three different forms: one as a free community download, second as a paid on-premise appliance and third as an on-demand software as a service basis. This tool support operating System like Windows, Linux, OS X.

Feng Office

This tool is very popular and used by more than 1 million people in 150 different countries, Feng Office offers features like project management, billing, document management, messaging and scheduling capabilities. FengSky provides both the free and paid versions that are cloud-based version, and Feng Onsite is the self-hosted version. Operating System uses like Windows, Linux, OS X.

EGroupware

EGroupware is the leading online collaboration tool. This tool is the top choice for big enterprises, small businesses and teams within and across organizations all over the globe. It offers community edition and enterprise edition. EGroupware offers paid hosting services with several different pricing tiers. This tool is operating system independent.

TeamLab

TeamLab helps to combine document editing, project management, mail, and CRM into a single suite. This is an open source tool. We can pay for a supported enterprise version, or use the hosted cloud version. Unlike most other tools, TeamLab also offers a free cloud version for non-profits organizations. This tool is operating system independent.

Seafile

This tool is collaboration solution, which includes cloud storage, mobile document access, file syncing, messaging

and other many capabilities. It is available in free version or paid private server versions or as a cloud-based service. This tool supports Linux OS.

E-MAIL MARKETING

OpenEMM

OpenEMM is the first open source application for e-mail marketing. OpenEMM is web-based enterprise application for email marketing, marketing automation, email newsletter and service emails (like transaction emails and event or time triggered emails) and lead management. To summarize it, OpenEMM is a tool for customer relationship management by email. OpenEMM offers a web-based user interface which works with all major browsers like Internet Explorer, Mozilla Firefox, Google Chrome and Safari. Operating System supported by this tool are Windows, Linux. It uses web container as Tomcat. [14]

PhpList

PhpList is the world's most popular open source email campaign manager. phpList brings you true privacy: your data belongs to you. Each phpList installation is self-contained and the inbuilt link tracking keeps you data private. phpList is Open Source, you can change service or software provider freely. In addition to the free download, it comes in a hosted version with fees based on the number of messages sent or the number of subscribers. Flexible plans start at only \$1: pay per-subscriber or per-message. This tool is operating system independent. [15]

ENTERPRISE RESOURCE PLANNING (ERP)

Odoo

Earlier Odoo known as Open ERP, Odoo claims more than 2 million users. It contains more than 3,000 individual apps that work together to help people manage their businesses. Main apps includes Website Builder, eCommerce, CRM, Accounting, Project Management etc. Odoo is an open source ERP and CRM tool, but it's primarily sold on a Software as a service basis. You can download installers and virtual machines, or run your own Odoo server in the cloud. This tool support operating System like Windows, Linux,

Openbravo

Openbravo offers open source commerce and ERP suite for agile retailers and agile businesses. The supported commercial versions by Openbravo are sold through third-party partners, but the company also offers a free download and hosted on-demand versions. The Openbravo Business Suite was launched in May 2015, replacing the previous Openbravo ERP Platform. It is a global management solution built on top of the Openbravo Technology Platform including horizontal ERP, CRM and BI functionality for across industries [16]. This tool is operating system independent.

xTuplePostBooks

xTuplePostBooks is a full-featured, fully-integrated business management system, the core of award-winning xTuple Accounting, CRM and ERP. Built to run in the cloud or on a local server, it provides the ultimate in power and flexibility for a range of businesses and industries, of any size. The self-proclaimed "world's #1 open source ERP," xTuple includes tools for accounting, time & expense, CRM, sales,

purchasing, manufacturing, inventory and distribution. Postbooks is the free open source version, but it comes in many other versions which can be download or used in the cloud. Operating System: Windows, Linux, Mac and mobile

Compiere

Compiere open source ERP software provides a modern, highly adaptable, low-cost ERP business solution. Compiere claims to be the most modern, adaptable and affordable ERP solution. It comes in community and enterprise editions, and while it is not available in software as a service version, it can be easily deployed to Amazon Web Services. Compiere ERP was named the Best of Open Source Enterprise Software in IDG's 2009. Operating System used Windows, Linux, OS X.

Opentaps

This application includes ERP, CRM functionality, ecommerce, business intelligence and many more. This tool is an open source in addition to the open source version, there is also a paid professional version. The company also has an easy-to-deploy Amazon Machine Image (AMI) that allows paid license holders to get Opentaps up and running on Amazon's cloud in just minutes. Operating System supports Windows and Linux.

HUMAN RESOURCE MANAGEMENT (HRM) TOOLS

OrangeHRM

This tool is supported by many companies Lufthansa, Sandals, Red Hat, Stanley Black & Decker and many other companies, OrangeHRM calls itself as the world's most popular HR software. It comes in open source, professional or enterprise versions, and all three can be deployed via OrangeHRM Live, a hosting service powered by Rackspace. Operating System: Windows, Linux, OS X.

WaypointHR

WaypointHR software is available as an open source. It can be downloaded or can use in a cloud environment. This tool offers additional features. It places the importance on security and ease of use while tracking employee demographic information and employment records. Operating System: OS Independent.

INVOICING TOOL

Simple Invoices

SimpleInvoices is a free web based invoicing developed by the community. It is developed basically for the community. It can run on a standalone desktop system or it can be set up on your own Web server or we can use hosting services provided by a third party partner. This tool is operating system independent.

PROJECT MANAGEMENT TOOL

Onepoint Project

Onepointproject combines project management (PM) and project portfolio management (PPM) capabilities into a single suite. It comes in many different commercial versions

and open source versions, comprising some additional cloud editions. Operating System: Windows, Linux, OS X.

LEARNING MANAGEMENT SYSTEMS

OpenSIS

This tool is designed for educational institutions of all sizes; This is a student information system which tracks demographics, rankings, report cards, attendance and much more. It comes under three different versions in community (free version), school (paid version) and district (paid) versions. Cloud-based hosting feature is also available with this tool. Operating System: OS Independent.

Canvas

Canvas tool is an instructor's canvas learning management system. This system goal is to make it easier to implement distance learning. This is used in one to one learning initiatives in K-12 or for higher education systems. This is available in both commercial and cloud versions; The open source version is easily available from GitHub. Operating System support Linux, Unix, OS X.

TIME TRACKING TOOL

TimeTrex

TimeTrex is a time tracking tool. TimeTrex tracks, manages employee scheduling, attendance, job costing and payroll jobs. We can deploy it on premise or it can be used the cloud hosted version. Operating System: Windows, Linux, OS X.

VPN TOOL

OpenVPN

OpenVPN is used to connect to your network securely. It is available as a paid enterprise solution, a free download or it can be used as cloud-based service. Operating System: Windows, Linux, OS X, Android, iOS.

III. IMPLETATION OF PRIVATE CLOUD

The cloud services are committed for one organization. It may assist different business units of same organization. The business units are logically separated so that they do not interfere with each other's operation. The cloud infrastructure may be succeeded and owned by organization or third party. It may be located on premise or off premise. The private cloud can provide all SaaS, PaaS, IaaS services and it is only accessed by trusted users only. Private cloud is characterized by high security of client data and more control over cloud infrastructure.

A. BUILDING A PRIVATE CLOUD STEP BY STEP

Building a private cloud is not a simple task, but once it is deployed and running it can significantly simplify IT work. A private cloud has some key profits for enterprise like agility, cost reduction, Innovation, Self Service, Availability, 360 degree view, elasticity etc. The following lists the sequence of steps essential for implementing a private cloud [12].

- Valuation of the present infrastructure is carried out to know the application data, workload and hosting environment.
- Physical infrastructure is evaluated to guarantee that it can be used for a private cloud solution. Otherwise, it needs to be refreshed as part of the data center transformation.
- A virtualization layer is built and can be based on VMware, Hyper-V or Xen.
- Asset management is deployed to track and update all the converged infrastructures via a discovery tool.
- Virtualization management tools are built over the infra layer.
- Asset management and virtualization management tools are integrated.
- The automation piece and orchestration layer is integrated over the virtualization infrastructure.
- Other tools within the management layer are deployed, such as ITSM, CMDB, and SRM.
- Integration between the automation and orchestration layer to the ITSM, CMDB is built.
- The service catalogs and ITFM are built.
- All the workflows for the orchestrator are built and configured. Creation of workflows and their storage in the orchestration library (provisioning, de-provisioning, remediation and auto ticketing) also occurs at this point.
- The CMDB is integrated with the discovery tool and asset management is completed to capture and perform asset and configuration management.
- A self-service portal for user access and catalog management is deployed.
- A template and images are created or imported from an existing environment.
- Billing and charge-back tools are implemented and integrated with CMDB.
- Once the setup, configuration and integration are completed, VMware and Hyper-V hosts to centralized cloud management are added or migrated.
- Functional, integration, UAT testing is then carried out on the implemented solution.
- Customized reports as per requirements for capacity, usage, billing and charge back information are implemented.
- The production environment is integrated with the deployed cloud management solution.
- The enterprise transitions to ASM for the management of day-to-day activities.

IV. CONCLUSIONS

The open source cloud platform provides features to end-user for improved scalability, portability, and flexibility as well as on-demand basis services. This paper explained what is a cloud computing, different services that are offered by cloud computing, Most of the commonly used open source software such as CloudStack, Eucalyptus, Nimbus, OpenStack, OpenNebula etc. as well as paid services offered by cloud. The implementation of private cloud would help the users to understand how to build private cloud and allows the users to choose better services according to their requirements and also make more unified decision on the open source cloud platform

according to their compatibility, scalability, implementation, interfaces, deployment requirement, and development support.

V. REFERENCES

- [1] Qi Zhang, Lu Cheng, RaoufBoutaba. Cloud Computing: State-of-the-art and research challenges. J Internet ServAppl (2010).
- [2] Rabi Prasad Padhy, ManasRanjanPatra, Suresh Chandra Satyapathy. Cloud Computing: Security Issues and Research Challenges. IJCSITS Vol. 1, No. 2, December 2011.
- [3] Nurmi, D., Wolski, R., Grzegorzczak, C., Obertelli, G., Soman, S., Youseff, L., & Zagorodnov, D. (2009, May). The eucalyptus opensource cloud-computing system. In Cluster Computing and the Grid, 2009. CCGRID'09. 9th IEEE/ACM International Symposium on (pp. 124-131). IEEE.
- [4] Sotomayor, B., Montero, R. S., Llorente, I. M., & Foster, I. (2009). Virtual infrastructure management in private and hybrid clouds. Internet Computing, IEEE, 13(5), 14-22.
- [5] Nurmi, Daniel, et al. "The eucalyptus open-source cloud-computing system."Cluster Computing and the Grid, 2009. CCGRID'09. 9th IEEE/ACM International Symposium on. IEEE, 2009.
- [6] <http://cloudstack.apache.org/> last access on 30 June 2013
- [7] <http://www.openstack.org/> last access on June 2013
- [8] <http://en.wikipedia.org/wiki/OpenNebula> on June 2013 last access on 30 June 2013
- [9] Barham, Paul, et al. "Xen and the art of virtualization." ACM SIGOPS Operating Systems Review 37.5 (2003): 164-177
- [10] <http://www.xenproject.org/> last access on June 2013
- [11] <http://www.vmware.com/> last access on June 2013
- [12] <http://www.techopedia.com/2/29245/trends/cloud-computing/building-a-private-cloud>
- [13] <http://www.datamation.com/open-source/60-open-source-apps-you-can-use-in-the-cloud-3.html>
- [14] <http://www.openemm.org/>
- [15] <https://www.phplist.com/>
- [16] Openbravo. "Openbravo Business Suite". Openbravo. Openbravo. Retrieved 8 July2015.