



# Apache Cloudstack: A Reliable and Scalable Cloud Computing Platform

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## Abstract:

Cloud computing is distributed computing technology which provides various services like on-demand Software, information, resources, infrastructure etc. Apache CloudStack is cloud computing technology founded by the Apache Software Foundation (ASF). Apache CloudStack is an open source, multi-tenanted cloud orchestration platform for delivering Infrastructure-as-a-Service (IAAS) in cloud computing environments. Apache CloudStack is used to deploy and manage the public, private and hybrid cloud. Apache CloudStack supports multiple hypervisors such as KVM, VMware ESXi/vSphere and XenServer for virtualization, highly available, highly scalable, complex networking, load balancer and VPN configurations in a multi-tenant environment. In this review paper, we discuss the main purpose of Apache CloudStack, architecture, deployment model and advantages and disadvantages. Cloud computing is the effective technology in the field of computers in the present day. It evolved from the grid computing, virtualization, utility computing and autonomic computing. It helps the end users to complete their purpose irrespective of their background and location with cost effective. It is obvious that anything user friendly and cost effective is always adopted by the public.

**Keywords:** Apache CloudStack, Cloud Computing, IAAS (Infrastructure as a Service), Hypervisor, information technology, sharable resources, grid computing, virtualization, autonomic computing.

## I. INTRODUCTION

### Cloud Computing:

Cloud computing uses shared multi-tenant environment which highly emphasizes on efficient, automated, and preferably virtualized IT infrastructure. Cloud provides IT resources (provided by third-party data centers) on demand from anywhere over a broad network and can be metered. Enablement of these features is made simpler and convenient using the technology called as virtualization. In this paper we try to simplify the terminologies used by giants in cloud computing to the level of beginners. We arranged this paper by (i) discussing the definitions from different giants of this field of cloud computing (ii) the uses and benefits of cloud computing (iii) Characteristics of cloud computing (iv) Cloud computing service models in a simplest way (v) Deployment Models of Cloud Computing and (vi) Security issues.

### IAAS

Cloud mainly provides three types of services, SAAS (Software as a Service), PAAS (Platform as a Service) and IAAS. IAAS service model provides IT infrastructure resources like storage, networks, and a capability of providing processing and other fundamental computing resources as services to the end users. The cloud infrastructure which relies on its own cloud is managed and control by service providers whereas consumer has control over an operating system, storage, deployed applications and may have control over networking services.

### CloudStack:

CloudStack is used to build private, public, community and hybrid IAAS clouds by pooling computing resources which is open source cloud computing software. The deployment models of cloud are public, private, community and hybrid.

- 1. Private Cloud:** This infrastructure is operated solely for an organization and may exist as on premises and off premises. It can be managed and controlled by their own organization or third party provider.
- 2. Public Cloud:** This service is provided to a large industry group or general public, and is owned and managed by the organization providing cloud services.
- 3. Community Cloud:** This is shared by multiple organizations and is supported by a specific community that has shared concerns. It may exist on premise or off premise, and can be managed by organization or third party provider.
- 4. Hybrid Cloud:** This deployment model is combination of two or more types of clouds (i.e. public, private, or community) and enables data and application portability between the clouds.

## II. APACHE CLOUDSTACK

### History of Apache CloudStack

Initially, CloudStack invented by Cloud.com. Most of the CloudStack software released as a free software under the GNU General Public License, version 3 (GPLv3), in May 2010. Citrix System purchased the Cloud.com on July 12, 2011. Then CloudStack software made available under Apache Software License and further development made by the Apache Foundation. Under GPLv3 Citrix released the remaining code and move towards for achieving more open process. In April 2012, Citrix donated CloudStack to Apache Software Foundation (ASF). After joining ASF on November 6, 2012, CloudStack 4.0.0 was declared the first stable release. Then Apache CloudStack becomes a top level project of ASF.

### Deployment Architecture of Apache CloudStack

In Apache CloudStack deployment architecture consists primary system as a CloudStack Management server (Apache

CloudStack software that manages cloud resources) and the secondary system performs as cloud infrastructure (Here, simple infrastructure consisting of one system running hypervisor software). In a case of smallest deployment, a single system can act as Management Server and Hypervisor host. An advanced installation of Apache CloudStack consists highly available, multi-node Management Server and hosts in ten thousands of number which may consist of various networking technologies. You provision resources such as storage, hosts, and IP addresses into the Management Server while setting up as well as managing an Apache CloudStack cloud.

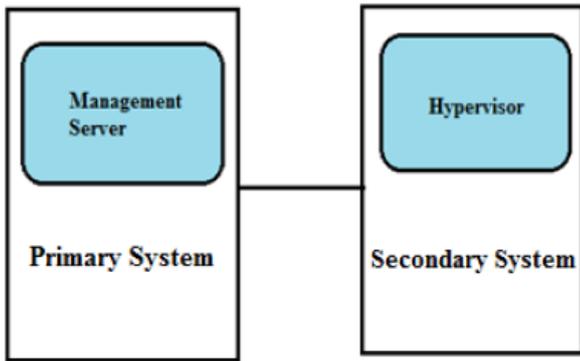


Fig.1 Deployment Architecture

**Figure.1. Deployment Architecture**

A single machine can act as both the Management Server and the hypervisor host when a user uses the KVM hypervisor (in smallest deployment). Administrators can manage and interact with the management server by using a UI or APIs, which also helps to control the cloud resources. Multiple management servers can be configured for redundancy and load balancing.

**III. FOUR DEPLOYMENT MODELS**

**Private cloud:** In this model the cloud is owned by an organization using proprietary architecture and runs cloud servers within its own datacenter. It has single-tenant architecture with direct control of underlying cloud infrastructure

**Community cloud:** This cloud infrastructure exclusive for a specific community of consumers from different organizations but have shared concerns. Practically it is owned, managed and operated by one or more organizations in the same community or a third party or the combination of them.

**Public cloud:** It is meant for general public use exists in the cloud provider premises and owned, managed and operated by business, academic or a government organization or some combination of them.

**Hybrid cloud:** It is a composition of two or more above discussed infrastructures that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability.

**SECURITY ISSUES**

**Data Protection**

In cloud computing data is secured if delivered internally. But when any critical data to be sent to the hands of a third party it on the service is to be encrypted all the times and the need of

managing the encryption keys which falls provider as responsibility.

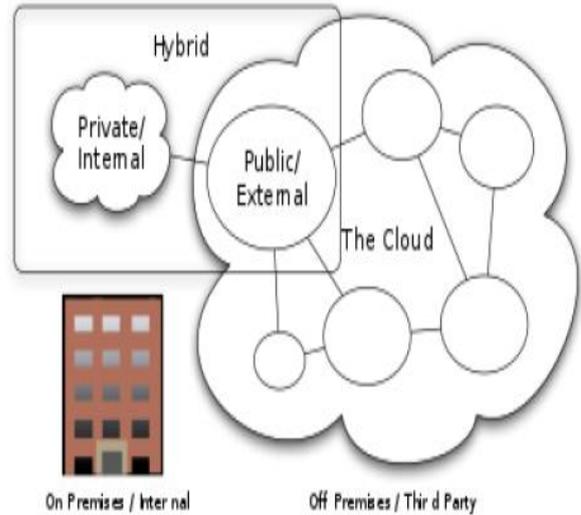


Figure.2. Data Protection

**User Authentication**

It is important to ensure that the data on cloud accessed only by the authorized customers or users and restrict others to do so. Though the service provider use access logs and audit trails for verification and future legal activities, (in fact they also needed to be secured), if needed, it is the responsibility of the user to ensure that the service provider taken all necessary security measures to protect his data.

**ADVANTAGES**

The main advantages of Apache CloudStack are, it provides a various featured solution to manage a cloud through an easy-to-use web interface, command line tools and a Restful API which allows easy integration of other tools and automation frameworks. Other advantages of Apache CloudStack are as follows:

1. Apache CloudStack is easy to use, configure and maintain
- It provides Enterprise-level Support
2. Allows support for plug-in framework

**DISADVANTAGES**

The major disadvantage of Apache CloudStack is it requires knowledge of Java, PHP, HTTP GET/POST, XML, JSON, URL of CloudStack server, API Key as well as a secret key. Other disadvantages of Apache CloudStack are as follows:

1. It does not provide customizable flexibility and modularity
- Provides support only for Fiber Channel as primary storage through hypervisor
2. Backup and restore is not provided efficiently

**KEY FEATURES AND BENEFITS**

**Features of CloudStack**

Apache CloudStack consists of various features as discussed below:

- **Secure Single Sign On:**  
This feature provides integration of existing applications with Apache CloudStack user interface through secure single sign-on option.
- **Multi-role Support:**  
This feature is used to provide multiple roles for managing and accessing the resources. It consist of three distinct roles, Admin -Admin role which can manage only virtual resources

within a particular domain and User role that can manage their own virtual resources.

- **On Demand Virtual Data center Hosting:**

This feature provides users with unlimited virtual resources – on demand, and on a Pay-as-you-go model.

- **Broad network Virtualization Capabilities:**

This feature provides support for embedded software based network management and VLAN. Direct Attached IP enables users to integrate their needs with virtual network architecture.

- **Secure Cloud Deployments:**

This feature ensures that role which has the access to manage and access physical resources, Domain the resources that are available to one particular user account are isolated from other user account based on their roles and zones.

- **Snapshot Management:**

This feature helps to overcome data loss and provides a way of disaster recovery, by providing the users capability of either capturing ad hoc snapshots of their disk or initiating a comprehensive schedule for taking snapshots of their data at regular intervals.

**Benefits of CloudStack**

- CloudStack allows users to serve themselves giving the information technology sector to remove roadblocks from providing fast service delivery and to shift focus on business problems.

- CloudStack easily automates the intensive tasks thereby reducing the cost incurred by the IT operations and provide services quickly.

- It allows providing standard workloads to ensure consistency within application and service delivery.

- Provides enhanced visibility into resource allocation and usage of services.

- Enhance the server/admin ratio by leveraging benefits of scale on a global basis.

#### IV. CONCLUSION

Cloud computing is essence of different technologies but it also has its own pros and cones. It gives real benefits to the customers and has the security problems when data on the cloud. Customers are expected to have strong protection to their data when at rest as well in transit. It is needed to have restricting and monitoring access to the data through user authentication and access logging and protect from the unauthorized.

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