CloudStack Overview

For CloudStack Version 3.0

Revised February 16, 2012

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# What Is CloudStack?

CloudStack™ is an open source software platform that pools computing resources to build public, private, and hybrid Infrastructure as a Service (IaaS) clouds. CloudStack manages the network, storage, and compute nodes that make up a cloud infrastructure. Use CloudStack to deploy, manage, and configure cloud computing environments.

Typical users are service providers and enterprises. With CloudStack, you can:

* Set up an on-demand, elastic cloud computing service. Service providers can sell self‑service virtual machine instances, storage volumes, and networking configurations over the Internet.
* Set up an on-premise private cloud for use by employees. Rather than managing virtual machines in the same way as physical machines, with CloudStack an enterprise can offer self-service virtual machines to users without involving IT departments.



# What Can CloudStack Do?

**Multiple Hypervisor Support**

CloudStack works with a variety of hypervisors. A single cloud deployment can contain multiple hypervisor implementations. You have the complete freedom to choose the right hypervisor for your workload. CloudStack is designed to work with open source Xen and KVM hypervisors as well as enterprise-grade hypervisors such as Citrix XenServer, VMware vSphere, and Oracle VM (OVM).

**Massively Scalable Infrastructure Management**

CloudStack can manage tens of thousands of servers installed in multiple geographically distributed datacenters. The centralized management server scales linearly, eliminating the need for intermediate cluster-level management servers. No single component failure can cause cloud-wide outage. Periodic maintenance of the management server can be performed without affecting the functioning of virtual machines running in the cloud.

**Automatic Configuration Management**

CloudStack automatically configures each guest virtual machine’s networking and storage settings.

CloudStack internally manages a pool of virtual appliances to support the cloud itself. These appliances offer services such as firewalling, routing, DHCP, VPN access, console proxy, storage access, and storage replication. The extensive use of virtual appliances greatly simplifies the installation, configuration, and on-going management of a cloud deployment.

**Graphical User Interface**

CloudStack offers an administrator's Web interface, used for provisioning and managing the cloud, as well as an end-user's Web interface, used for running VMs and managing VM templates. The UI can be customized to reflect the desired service provider or enterprise look and feel.

**API and Extensibility**

CloudStack provides an API that gives programmatic access to all the management features available in the UI. The API is maintained and documented. This API enables the creation of command line tools and new user interfaces to suit particular needs. See the Developer’s Guide and API Reference, both available at <http://docs.cloud.com/CloudStack_Documentation>.

The CloudStack platform pluggable allocation architecture allows the creation of new types of allocators for the selection of storage and Hosts. See the Allocator Implementation Guide (<http://docs.cloud.com/CloudStack_Documentation/Allocator_Implementation_Guide>).

**High Availability**

The CloudStack platform has a number of features to increase the availability of the system. The Management Server itself may be deployed in a multi-node installation where the servers are load balanced. MySQL may be configured to use replication to provide for a manual failover in the event of database loss. For the Hosts, the CloudStack platform supports NIC bonding and the use of separate networks for storage as well as iSCSI Multipath.

# Cloud Infrastructure

## Software and Hardware

A CloudStack installation consists of two parts: the CloudStack Management Server software and the cloud infrastructure that it manages. When you set up and manage a CloudStack cloud, you provision resources such as hosts, storage devices, and IP addresses into the Management Server, and the Management Server manages those resources.

The Management Server manages one or more zones (typically, datacenters) containing host computers where guest virtual machines will run. Each zone is organized into pods, clusters, and hosts. The hosts run hypervisor software and provide resources for end users to run virtual machines.

## Networking

### Networking Models

CloudStack offers two types of networking scenario:

* **Basic.** For AWS-style networking. Provides a single network where guest isolation can be provided through layer-3 means such as security groups (IP address source filtering).
* **Advanced.** For more sophisticated topologies. This network model provides the most flexibility in defining guest networks.

### Physical Networks

A physical network is the actual network hardware and wiring in a zone. A zone can have multiple physical networks. CloudStack provides configuration settings that administrators can use to set up a physical network in a zone. The administrator can:

* Add/Remove/Update physical networks in a zone
* Configure VLANs on the physical network
* Configure a name so the network can be recognized by hypervisors
* Configure the service providers (firewalls, load balancers, etc.) available on a physical network
* Configure the IP addresses trunked to a physical network
* Specify what type of traffic is carried on the physical network, as well as other properties like network speed

### Virtual Networks

A virtual network is a logical construct that enables multi-tenancy on a single physical network. In CloudStack, a virtual network can be shared or isolated. An isolated network can be accessed only by virtual machines of a single account. A shared network can be accessed by virtual machines that belong to many different accounts. Network Isolation on shared networks is accomplished using techniques such as security groups.

# User Services

In addition to the physical and logical infrastructure of your cloud, and the CloudStack software and servers, you also need a layer of user services so that people can actually make use of the cloud. This means not just a user UI, but a set of options and resources that users can choose from, such as templates for creating virtual machines, disk storage, and more. If you are running a commercial service, you will be keeping track of what services and resources users are consuming and charging them for that usage. Even if you do not charge anything for people to use your cloud – say, if the users are strictly internal to your organization, or just friends who are sharing your cloud – you can still keep track of what services they use and how much of them.

## Virtual Machines

Hosts in a CloudStack deployment provide the computing resources to run guest virtual machines for end users. Each host has hypervisor software installed on it to manage the guest VMs. In a CloudStack cloud, guest VMs can communicate with each other using shared infrastructure with the security and user perception that the guests have a private LAN.

CloudStack provides administrators with complete control over the lifecycle of all guest VMs executing in the cloud. The CloudStack platform provides several guest management operations for end users and administrators. VMs may be stopped, started, rebooted, and destroyed.

## Service Offerings, Disk Offerings, Network Offerings, and Templates

A user creating a new virtual machine instance can make a variety of choices about its characteristics and capabilities. CloudStack provides several ways to present users with choices when creating a new instance:

* Service Offerings, defined by the CloudStack administrator, provide a choice of CPU speed, number of CPUs, RAM size, tags on the root disk, and other choices.
* Disk Offerings, defined by the CloudStack administrator, provide a choice of disk size for primary data storage.
* Network Offerings, defined by the CloudStack administrator, describe the feature set that is available to end users from the virtual router or external networking devices on a given guest network.
* Templates, defined by the CloudStack administrator or by any CloudStack user, are the base OS images that the user can choose from when creating a new instance. For example, the CloudStack platform includes CentOS as a template.

## Using Projects to Organize Users and Resources

CloudStack users can group themselves into projects so they can collaborate and share virtual resources. CloudStack tracks usage per project as well as per user, so the usage can be billed to either a user account or a project. For example, a private cloud within a software company might have all members of the QA department assigned to one project, so the company can track the resources used in testing while the project members can more easily isolate their efforts from other users of the same cloud.