



VMware vCloud™ Requirements for a Cloud

Version 1.6

TECHNICAL WHITE PAPER

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1. Defining the Cloud

Cloud computing is an approach to computing that leverages the efficient pooling of on-demand, self-managed virtual infrastructure, consumed as a service. This document, *Requirements for a Cloud*, discusses the requirements for building an *Infrastructure as a Service* (IaaS) cloud.

According to NIST (National Institute of Standards and Technology), the key components of a cloud are on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service. VMware, in turn, has long defined cloud as elastic, lightweight entry and exit, available over Internet protocols, and running on a shared infrastructure. As you can see, these definitions have many common points and as such we'll use that as the basis for our requirements.

A cloud always starts with a shared, virtual infrastructure. If any resource is dedicated for only one customer then what you are building is a managed hosting platform and not a cloud infrastructure. Similarly if there are great acts that must be taken by the cloud administrator or service provider in order to provision resources in the cloud after a consumer requests them, then you do not have a cloud.

VMware's cloud blueprint follows these basic requirements as the foundation for an IaaS cloud.

1. A cloud must be built on a *pooled*, virtual infrastructure. This includes not only the CPU and memory resources but also the storage and networking and associated services.
2. The cloud should provide *application mobility between clouds*, allowing the consumer to easily enter the cloud and exit the cloud with existing workloads. The use of existing consumer tools for performing the migration of workloads to or from the cloud is highly desirable.
3. The cloud should be *open and interoperable*, allowing the consumer to consume cloud resources over open, Internet standard protocols. There should not be a requirement for specific networking or clients in order to access cloud resources.
4. The cloud consumer should only pay for resources they consume or commit to consuming.
5. The cloud should be a secure and trusted location for running cloud consumer workloads.
6. The cloud consumer should have the option and the ability to protect their cloud-based workloads from data loss.
7. The cloud consumer must not be responsible for the maintenance of any part of the shared infrastructure, or have to interact with the cloud provider to maintain the infrastructure, including storage and network maintenance, on-going patches, or business continuity activities. The cloud should be available to run high availability workloads and any faults occurring in the cloud infrastructure should be transparent to the cloud consumer as a result of *built-in availability, scalability, security and performance guarantees*.

2. Additional Cloud Requirements

After you have the foundation for the infrastructure as a service cloud you can begin to layer additional requirements on top of it. VMware is building enterprise-focused clouds which require higher degrees of availability and security than an entry level consumer cloud. As such, the following are additional requirements for an enterprise-focused cloud.

1. Operational Considerations
 - a. The cloud should have a built-in orchestration framework that enables the quick scaling of infrastructure or services for cloud consumers. This orchestration framework will be used by the cloud provider.
 - b. The cloud consumer should have access to detailed logs from the cloud environment. These logs should be multi-tenant in nature, showing only the entries pertinent to the cloud consumer's workloads.

- c. The cloud consumer should have a mechanism to balance the load between their workloads across the cloud infrastructure.
 - d. There should be some mechanism for cloud consumers to take snapshots of their workloads and save them for future use or data recovery.
 - e. There should be some way for the cloud provider to monitor capacity of the environment and be proactively alerted to capacity shortages or trends.
 - f. There should be some way for the cloud consumer to monitor the performance of their workloads to ensure SLAs are met.
2. Architectural Considerations
- a. The cloud should have the ability to federate with other clouds through a common interface. Services do not necessarily need to be federated, but a cloud consumer should have access to a common interface across several cloud environments.
 - b. There should be some way for the cloud consumer to protect their workloads from network attacks. At minimum there should be firewall services available to the cloud consumer and configurable by the cloud consumer.
 - c. The cloud should have a rich networking environment that allows for isolating workloads from one another.
 - d. The cloud environment should be able to pass an ISO 27001 and SAS 70 Type II audit. These audit reports should be made available to the cloud consumer upon request.
 - e. The cloud should be capable of being built to meet PCI standards and pass a PCI audit.
 - f. The cloud provider should furnish a high-level SLA of at least 99.9%. In order to provide this level of service an implemented disaster recovery plan should be in service. This disaster recovery plan should be for the recovery of an entire cloud site from one location to another.
3. Content Management
- a. The cloud consumer should have a location to store their own custom images as templates.
 - b. The cloud provider should provide a common set of images to the cloud consumer to use. These standard images will be stored in a catalog.

3. The VMware-Powered Cloud

The VMware-powered cloud is a solution set drawn from many areas of VMware's product portfolio.

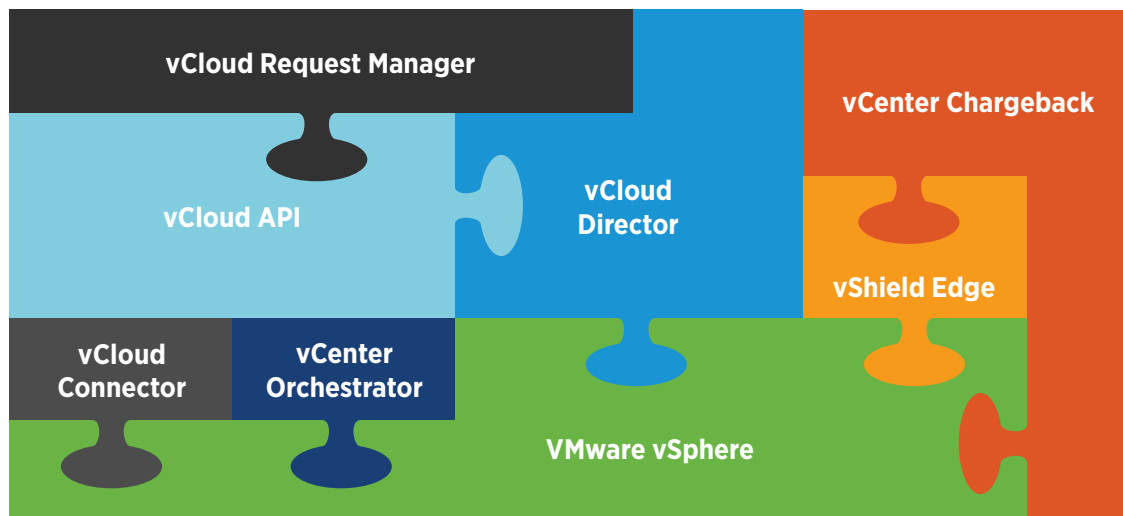


Figure 1. vCloud Overview

VMWARE PRODUCT	ROLE
vCloud Director	Establishes the UI, API and provisioning functionality required to instantiate “as-a-service” virtual offerings with secure multi-tenancy. Establishes the second order of resource abstraction by organizing pure virtualized resources into virtual datacenters. At this level, resources are aligned with policy and consumers as public, private or hybrid compute clouds. There is a database backing the environment as well. The database is shared with multiple ‘cells’ or installations of vCloud Director, if they exist.
vSphere	Establishes the first order of resource abstraction by virtualizing the four main components every server contains: compute power, memory capacity, network connectivity and storage capacity.
vShield	Establishes secure areas of network isolation and network services such as NAT and DHCP. Deployed on demand by vCloud Director to create new zones of isolation depending on the needs of the cloud provider and consumer.
vCenter Chargeback	Collects usage data from multiple points in the architecture to aggregate consumption into reports that can be used to invoice for cloud resources consumed.

DOCUMENTATION	OVERVIEW
<i>vCloud Service Definitions</i>	There are two service definition documents—one for service provider clouds and one for private clouds. These service definitions take the requirements from this document and build them into a service definition that a cloud provider can offer to cloud consumers. The two service definitions are also attached to VMware vCloud marketing programs. The rest of the architecture kit was written around these service definitions.
<i>Architecting a vCloud</i>	This document gives detailed guidance on how to take the products and solutions from VMware and build them into a cloud that meets the requirements and service definitions defined in this kit. The <i>Architecting a Cloud</i> document is not a replacement for product documentation or how-to guides. Instead it aims to pass along the vast number of man-years of knowledge from the Cloud Practice at VMware to cloud providers so that they may in turn build truly enterprise class clouds.
<i>Implementation Examples</i>	The implementation examples provide a look at a completed cloud environment, including all of the implementation details. The documents detail exact wiring and configuration information from a completely implemented cloud that followed the guidance and requirements set forth in this kit. The <i>Implementation Examples</i> come from real world implementations of both a service provider and private cloud.

