

Open Cloud System 2.5

Storage Feature Brief

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Open Cloud System (OCS) 2.5 Storage Overview

There are three types of storage available in an OCS elastic cloud implementation:

- 1) **OCS Ephemeral Storage** - Fast Block Storage for Dynamic Access. Ephemeral storage exists only for the life of an instance. It persists across reboots of the guest operating system, but when the instance is deleted so is the associated ephemeral block storage.
- 2) **OCS Block Storage** - Elastic and Mission Critical Block Storage for Dynamic Access. Volumes are persistent virtualized block devices independent of any particular instance. Volumes may be attached to a single instance at a time, but may be detached or reattached to a different instance while retaining all data, much like a USB drive.
- 3) **OCS Object Storage** - Scalable and Replicated Object Storage for Long Term Retention. It is ideal for storing media files, logs, virtual machine images and backups. Object Storage is highly resilient against server and disk drive failures as the data is replicated and distributed. Designed for long term, durable storage, OCS Object Storage can be scaled nearly infinitely.



Cloudscaling OCS provides all three storage options to address durability and performance requirements that scale linearly at disruptive price points for customers building elastic clouds. OCS is architected to be flexible and allow customers to build OpenStack-based elastic clouds using one or more of the above storage types in a variety of combinations to address a spectrum of applications, use cases and cost.

OCS Storage Benefits Summary

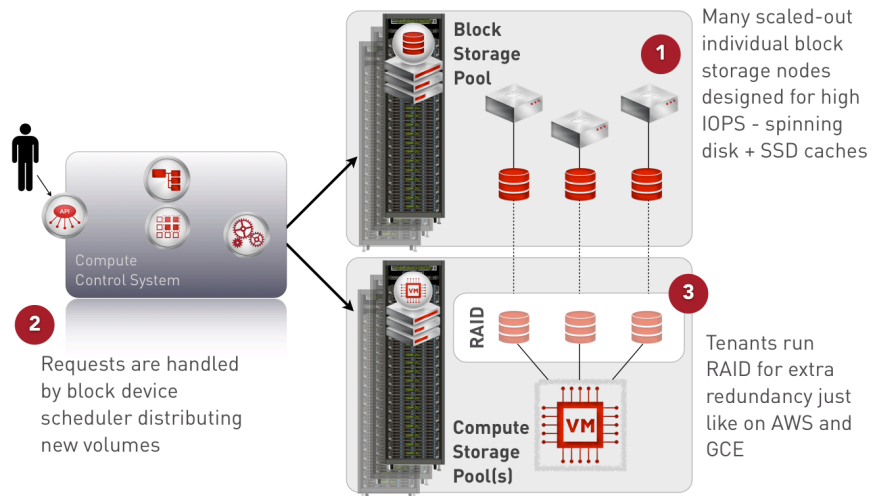
	Benefit
Ephemeral	<ol style="list-style-type: none"> 1. Storage is co-located with compute node, reducing physical footprint and overall cost. 2. High speed local access to storage for instances. 3. Ideal for stateless applications such as web servers.
Block	<ol style="list-style-type: none"> 1. All storage is centralized and segregated from compute nodes. 2. Data persists after instance is terminated so ideal for both boot and data volumes. 3. Volumes can be attached and detached “on the fly”. 4. Combination of SSD and spinning media for best price/performance. 5. Volumes can be RAID striped for increased capacity, performance and redundancy. 6. Ideal for applications requiring high IOPs such as databases.
Object	<ol style="list-style-type: none"> 1. All storage is centralized and segregated from compute nodes. 2. Storage can be deployed as a standalone cloud independent of compute cloud. 3. All stored data is triple replicated and distributed for high redundancy. 4. Lower per GB cost compared to ephemeral and block storage. 5. Serves as repository for block storage snapshots. 6. Ideal for long term retention of data.

OCS Ephemeral Storage

OCS Ephemeral Storage delivers cost-effective local block storage. OCS Ephemeral Storage is co-located within the OCS Compute nodes, providing instances direct access to storage for boot volumes.

OCS Block Storage Overview

In contrast, OCS Block Storage delivers high performance, *persistent* block storage for mission critical workloads running in the cloud. OCS Block Storage provides block-level storage volumes for use with virtual machine instances. OCS Block Storage can be thought of as an on-demand disk drive service that is easy to use.



OCS Block Storage volumes:

- Are network attached so the storage is centralized and easier to manage
- Provide better performance and SLA compared to ephemeral storage
- Can be snapshot to OCS Object Storage for retention and reuse
- Provide SSD performance at spinning disk prices

OCS Block Storage addresses a variety of use cases that reduce CAPEX and OPEX. Since OCS Block Storage volumes can be requested using supported user interfaces or APIs, consuming cloud block storage is trivial. New volumes can be attached to running instances and appear as block devices just like any hard drive. Finally, since OCS Block Storage volumes persist independently from the life of an instance, data on OCS Block Storage remains available to be used again.

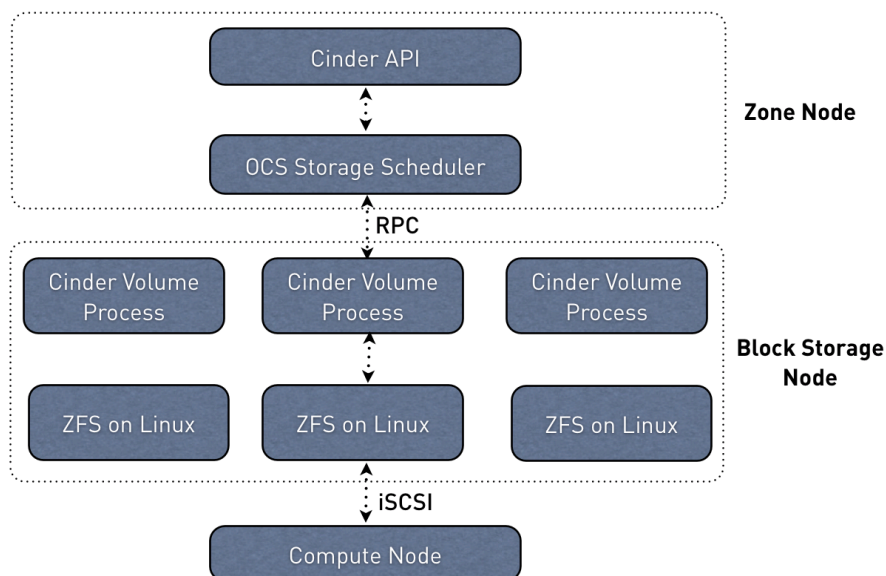
OCS Block Storage Benefits

OCS Block Storage can be thought of as a scalable, on-demand disk drive service. OCS Block Storage volumes can be up to 1 TB in size and multiple volumes can be attached per instance. A user can create an instance, request OCS Block Storage volumes, attach them “on the fly”, process data, terminate the instance and the data on the OCS Block Storage volume remains available for future access. OCS Block Storage can support high-performance storage requirements as well as instances that require large datasets such as for databases and big data projects.

OCS Block Storage is based on Cloudscaling CloudBlocks architecture. CloudBlocks provides a unified software and hardware reference architecture for enabling managed blocks of cloud capacity to match application workload demands with the appropriate virtual infrastructure resources. CloudBlocks let you design, deploy and manage one rack or container at a time. Users of OCS Block Storage scale up their block storage capacity by adding additional OCS Block Storage blocks.

The OCS Storage Scheduler for OCS Block Storage maximizes volume dispersion on a per tenant basis to reduce the impact of infrastructure failures on volume availability. Tenants can request and allocate a number of block volumes and aggregate them into a single software RAID set, knowing that individual volume failures will simply look like failed disk drives in the RAID array, which can be easily replaced using the standard process.

OCS BLOCK STORAGE ARCHITECTURAL OVERVIEW

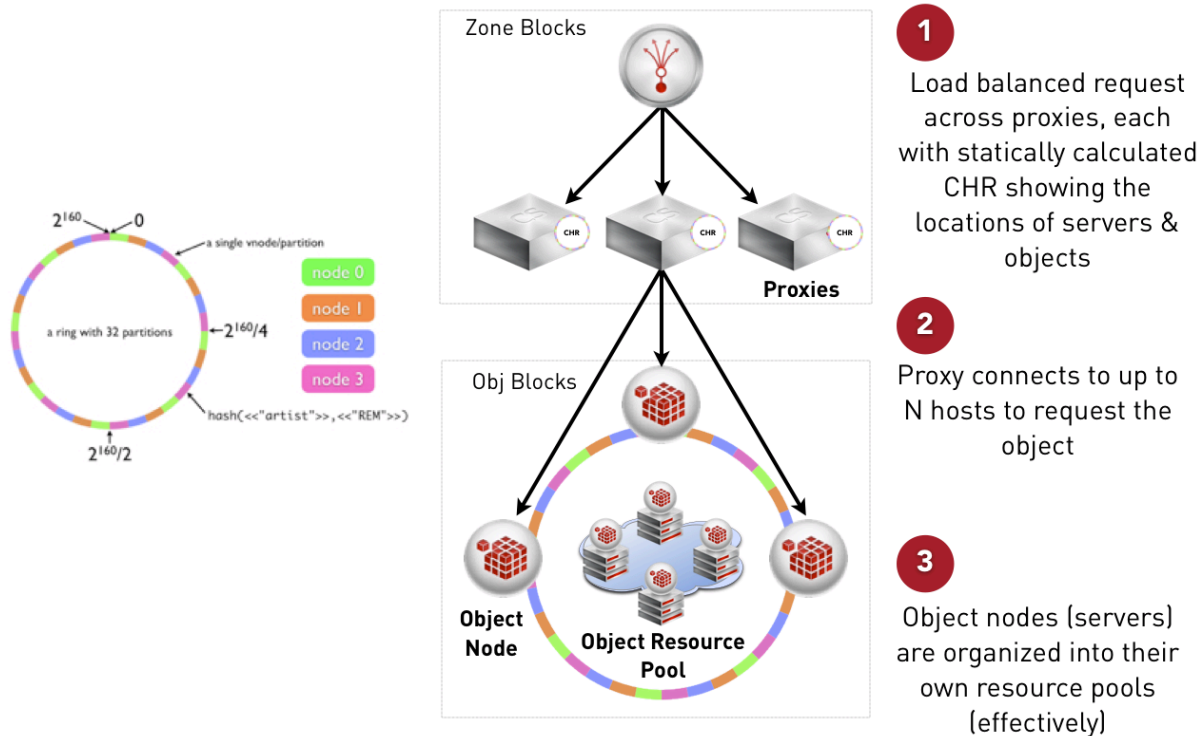


OCS Object Storage

OCS Object Storage provides a triple-replicated, scale-engineered and durable repository for arbitrary files. It is ideal for storing media files, logs, virtual machine images and backups. Object Storage is highly resilient against server and disk drive failures as the data is replicated and distributed. Designed for long term, durable storage, OCS Object Storage can be scaled nearly infinitely.

It uses a Consistent Hash Ring algorithm to maintain three copies of each file across disk drives on the cluster. Each ring can reference millions of files and you can create many rings – supporting object storage growth to many tens of petabytes. OCS Object Storage also checks file integrity to determine if files have inadvertently changed or succumbed to bit rot and then repairs damaged files from known good copies.

OCS Object Storage is based on OpenStack Swift and the Cloudscaling CloudBlocks architecture using high capacity SATA drives. OCS Object Storage capacity is scaled out by adding additional OCS Object Storage blocks.



Scale Engineering via CloudBlocks

CloudBlocks provides a unified software and hardware reference architecture for enabling managed blocks of cloud storage capacity to match application workload demands with the appropriate virtual infrastructure resources. CloudBlocks let you design, deploy and manage one rack or container at a time. CloudBlock benefits include:

- Choice of hardware options from the Hardware Certification List
- Automated installation and deployment of storage nodes
- Scale out architecture which allows simple addition of nodes to expand storage

Both OCS Block Storage and OCS Object Storage are built using CloudBlocks. To the right are samples of standard deployment options for OCS Block Storage and OCS Object Storage.

Block



1-2 T0R Switch
1 Management Switch
6-16 Block storage nodes (2U each)
240 TB MAX usable per Block

Object



1-2 T0R Switch
1 Management Switch
5 Object storage nodes (6U each)
180 TB MAX usable per Block

OpenStack API and Tool Support

OCS Storage is consumed using tools that use the OpenStack, EC2 and S3 APIs. Tools include commercial products such as RightScale and Enstratus as well as open tools such as OpenStack Horizon, HybridFox, Cyberduck, euca2ools and boto.

Contact Us

To learn more about how Cloudscaling's products and services can help you deploy and manage private elastic cloud capabilities, just give us a call at +1-415-508-3270, email us at sales@cloudscaling.com or visit our website at www.cloudscaling.com.

ABOUT CLOUDSCALING

Cloudscaling is the leader in elastic cloud infrastructure. The company's core product, Open Cloud System (OCS), is the world's most advanced OpenStack cloud infrastructure system. OCS is designed to meet the requirements of next-generation dynamic applications, delivering the agility, performance and economic benefits of leading cloud providers, but deployable in the customer's data center and under the IT team's control. Cloudscaling is backed by Trinity Ventures and headquartered in San Francisco. For more information, please visit www.cloudscaling.com.

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Cloudscaling is the trusted source for information on OpenStack and together with the community is making OpenStack more production-grade. For more information, please visit www.openstack.org.