Cloudian HyperStore with Cisco UCS S3260

Validated Design for On-premises and Hybrid Cloud Storage Solution

100% Native S3 Object Storage in your Data Center

The powerful petabyte scalable solution for unstructured data

With the popularity of rich media, the proliferation of mobile devices and the digitization of content, there has been an exponential growth in the amount of unstructured data that IT must manage. This unprecedented growth in unstructured content is simply not sustainable for current NAS/SAN infrastructures. In fact, the whole storage system is breaking down. Backups and restores are taking longer, migrations from older storage systems to new storage systems are labor intensive, Provisioning storage for users is more frequent and time consuming, and the list goes on and on.

As data growth continues to outpace the growth of IT budgets, a brand-new storage approach becomes an absolute requirement. Software-defined object storage offers an alternative approach to NAS/SAN systems.

This reference design provides an overview of the joint Cisco UCS and Cloudian HyperStore software-defined scale-out object storage solution. It provides both detailed architecture and supporting performance information. The intent of this document is to enable the reader to understand how Cloudian HyperStore can be deployed on Cisco UCS servers.

The paper covers details of the setup and observed performance on a non-tuned system. For load generation and testing we used Intel's Cosbench tool, which has become an industry standard to verify and test object storage performance. Details of the test setup and parameters used can be found in the proceeding performance section.

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SOLUTION OVERVIEW

The Cisco UCS S3260 appliance powered by Cloudian HyperStore provides affordable, efficient, high-capacity storage to meet the growth of unstructured data—media images, video, backups, web content, file shares. It makes it easy to build full-featured, on-premise Amazon S3-compliant storage at a cost of pennies per GB per month. The pre-validated turnkey system, based on the Cloudian HyperStore® object-storage platform, provides petabyte-level scalability, high resiliency, geographic independence, and multi-tenancy. All at 70% less TCO than conventional storage.

ENTERPRISE USE CASES

Data powers many of today's most innovative businesses, and the Cisco UCS S3260 powered by Cloudian provides an affordable, highly efficient and durable storage platform to meet the growth of unstructured data. Target use for the solution includes:

- Backup and Archive
- Enterprise file sync and share
- Private and Hybrid cloud
- Cloud Tiering

INTRODUCTION TO CLOUDIAN HYPERSTORE

Cloudian provides enterprise-grade storage solutions for on premise, private and hybrid clouds. Cloudian's flagship product, HyperStore, is the only S3-compatible storage platform that enables scalable, secure and cost-

effective object storage solutions for hybrid clouds. It delivers multi-data center storage with no constraints on data size; unlimited scale; optional, fully automated data tiering to any S3 cloud; and support for all S3 ecosystem applications (1000+ and growing)—all behind your firewall. HyperStore ensures seamless S3 integration with every available AWS/S3 application. Gone are islands of data with limited capacity and accessibility.

With guaranteed S3 compatibility, HyperStore's peer-to-peer architecture allows almost endless scaling. Scale from as few as three servers to many hundreds of servers, across data centers and geographic regions. The system is designed for always-on data storage with protection using Erasure Coding and Replication. It is secured with encryption, certificate-based access controls, and multi-tenancy controls.

CLOUDIAN HYPERSTORE FEATURES

Cloudian HyperStore object solution combines robust availability with system management control, monitoring capabilities and reporting. The list of features, including hybrid cloud streaming, virtual nodes, configurable erasure coding, and data compression as well as encryption helps set Cloudian HyperStore apart with highly efficient storage and seamless data management that lets users store and access their data where they want it, when they want it.

100% NATIVE S3

Several years ago, public cloud providers realized that applications are driving the need for cloud storage. Amazon Web Services (AWS) started a cloud revolution in early 2006 when they launched the Amazon Simple Storage Service (Amazon S3). Amazon S3 is a massively scalable, cost-effective cloud storage solution developed specifically to house the massive influx of data created by organizations worldwide.

Today Amazon's S3 API supports an ecosystem of over 350+ compatible applications. It's clear that Amazon has established itself as the dominant leader in public cloud storage. Cloudian provides a native S3 API allowing for the highest S3 compatibility among object storage solutions. Keeping up with the latest features of the S3 API is important as more and more applications become S3 compatible and start using the advanced S3 functionalities. With no standards enforced for claiming s3 compatibility, choosing the right platform can be challenging. Cloudian makes the choice easy by giving customers the guarantee that all their S3 applications will work seamlessly.

SECURITY

With data security breaches becoming more commonplace, it is essential for businesses to safeguard their data from the prying eyes of data hackers and unauthorized users. Cloudian HyperStore simplifies the data encryption process by providing transparent key management at the server or node layer. This relieves administrators from the burden of having to manage encryption keys and eliminates the risk of data loss occurring due to lost keys. Furthermore, encryption can be managed granularly—either at a bucket level or down to an individual object.

Cloudian HyperStore AES-256 server-side encryption enables enterprises and service providers to easily encrypt data stored at rest. SSL encryption ensures data confidentiality for data in transit (HTTPS). And with S3-compatible object-level ACLs, system administrators can better manage access to buckets and objects.

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MULTI-DATACENTER AND MULTI-REGION

Cloudian HyperStore software can further scale while increasing durability by replicating data across multiple datacenters (availability zones). Reads and writes are always performed at the local datacenter with remote replication performed in the background to avoid latency of remote writes.

Cloudian HyperStore software supports multiple regions with shared multi-tenant management to enable both geographic optimization and unlimited scale. Data can be placed in specific regions for security, policy, cost or other reasons.

SELF-SERVICE IT

Robust management controls, including system health monitoring, make non-disruptive system maintenance and up-grades a snap. As a multi-tenant solution, Cloudian HyperStore software gives role-based access to system and group administrators and to users. Cloudian HyperStore provides an easy to use GUI and REST API to facilitate quotas, user pro-visioning, system administration, usage reporting, billing automation at the group level, and flexible rating plans. Quality of Service (QoS) controls allow IT administrators to control access and usage.

MULTI-TENANCY

Advanced identity and access management features allow system administrators to provision and manage groups and users, define specific classes of service for groups and users and configure billing and charge-back policies. Both administrators and users benefit from unique reporting operations and account and data management capabilities. Multiple credentials per user is also supported. Configurable group—and user-level QoS rate limits ensure groups and users do not exceed storage quotas or consume bandwidth in a manner that impacts other tenants.

INTEGRADED BILLING, MANAGEMENT

Cloudian HyperStore provides system/cluster monitoring and data management, full provisioning and management of users, groups, rating plans, QoS controls and billing via graphical user interface or REST-ful APIs. This comprehensive API coverage enables tight integration with the user's provisioning, authentication and billing systems. Support for multiple billing and subscription revenue models supports both cloud service providers (CSPs) and enterprise chargebacks. The graphical user interface is highly and easily customizable to provide better integration in existing environments.

REFERENCE DESIGN AND CONFIGURATION

The reference design used for this testing was built using three Cisco S3260 chassis with a total of six nodes (two per chassis). Three nodes were used to create a Cloudian HyperStore cluster and the remaining three nodes were used as client nodes. All nodes were connected using 40G Ethernet via Cisco UCS VIC 1300. All Cisco S3260 nodes were equipped with the same hardware:

2	Intel Xeon CPU E5-2680 v4
8	16GB DDR4 memory
2	480GB SSD
28	8TB NL-SAS HDD
1	Cisco VIC 1300

NODE INSTALLATION

All nodes were installed with the Cloudian ISO that ships with HyperStore 6.1. The ISO is a slightly modified version of Centos 6.8 that incorporates specific settings that are optimal for Cloudian HyperStore.

CISCO SWITCH CONFIGURATION

All nodes in the test setup were equipped with a 40GB SIOC to a Cisco Nexus 9332PQ Switch.

CLOUDIAN CONFIGURATION

The Cloudian HyperStore cluster was installed by using three nodes. The cluster nodes were setup in a single logical Data Center (DC) with a storage policy of three replicas. The total raw capacity in this setup was 672TB. When using the RF3 storage policy, three replicas of all objects are created and distributed across the nodes providing ultimate redundancy. The usable capacity in this setup was 224TB. Cloudian supports the use of different erasure coding configurations from a minimum of six nodes.

LOAD GENERATION

To generate load on the object store we used Intel's Cosbench which has become an industry standard to verify and test object storage performance. For the Cosbench test setup we used three nodes that were installed with Centos 6.8. In addition to Cosbench we also installed HAProxy on each of the client nodes to ensure optimal distribution of data.
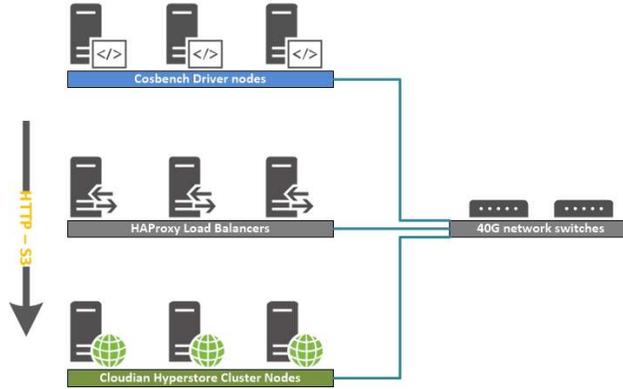
COSBENCH WORKLOAD

To show the results for different load characteristics, workload with the following specification was run:

- S3 storage type
- 100 worker threads
- 4K, 16K, 64K, 1M, 16M and 64M object sizes
- Get and put operations
- 10800 seconds of run time per operation

PERFORMANCE TESTING

The test performed in the standard testing template was to perform object storage operations and show representative performance characteristics that are possible using HyperStore on Cisco UCS appliances in replication mode. This was to test the system under load and was not a scaled or optimized performance test. Running load against a system is the best way to validate platform support.

PERFORMANCE RESULTS

The following table reflects the results of running the Cosbench workload on the Cisco S3260 HyperStore platform.

Object Size	Threads	Operation	Transactions /s	Bandwidth MB/s	Succes ratio %
4KB	100	read	17064.45	66.65800781	100
16KB	100	read	15437.84	241.21625	100
64KB	100	read	12017.39	751.086875	100
1MB	100	read	2805.79	2805.79	100
4MB	100	read	679.42	2717.68	100
16MB	100	read	166.4	2662.4	100
64MB	100	read	42.75	2736	100

Object Size	Threads	Operation	Transactions /s	Bandwidth MB/s	Succes ratio %
4KB	100	write	2765.58	10.80304688	100
16KB	100	write	2696.59	42.13421875	100
64KB	100	write	2240.45	140.028125	100
1MB	100	write	619.24	619.24	100
4MB	100	write	152.62	610.48	100
16MB	100	write	39.14	626.24	100
64MB	100	write	9.81	627.84	100
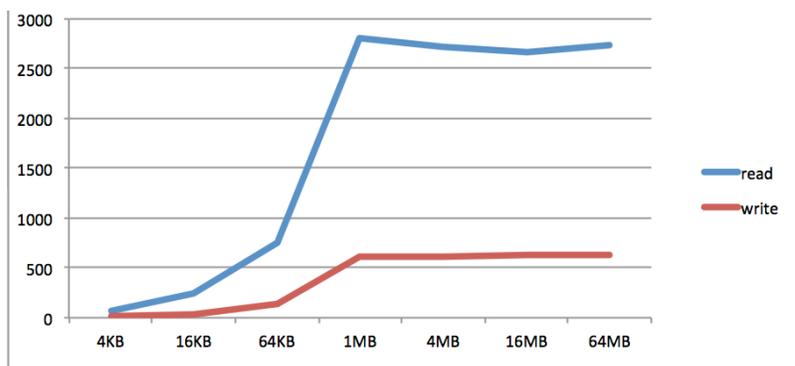
Cloudian HyperStore has been tested and certified on the Cisco S3260 storage server. All functional tests were completed and passed.
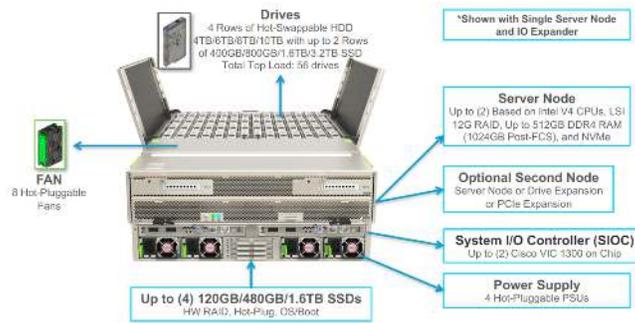
Evaluation Test	Success Criteria	Final Result
Demonstrate Cloudian Cluster Installation	• Demonstrate installation of cluster through a single console • Provide basic explanation of HyperStore components, architecture	Success
Demonstrate Basic Cloudian Functions	• Cloudian Management Console (CMC) walkthrough • Create a group • Create a user • Create a bucket • Upload user data into the bucket	Success
Demonstrate Cloudian Protection Capabilities	• Demonstrate creation and verification of data based on replication • Demonstrate creation and verification of data based on Erasure Coding	Success
Demonstrate Basic S3 Compatibility	• Dragon Disk Demo - Demonstrate integration with off the shelf third party S3 browser	Success
Demonstrate Advanced Cloudian Functions	• Demonstrate Cloudian QoS capabilities • Demonstrate Multi-Tenant support • Configure Auto Tiering to S3 and other S3 Compatible clouds • Demonstrate configuration of per bucket storage policies • Demonstrate Cloudian Reporting capabilities	Success
Demonstrate Cloudian Enterprise Resiliency Functions	• Demonstrate node failure and recovery • Please note: Network and disk failure did not need to be tested in this setup	Success
Demonstrate and measure Cloudian Performance	• Explain Cloudian test suite use for load generation • Provide standardized testing tools to the customer	Success

CONCLUSION

The Cisco UCS S3260 powered by Cloudian scale-out object storage solution provides the right density and price while providing the highest quality hardware. Cisco UCS management provides simplified management capabilities while Cloudian HyperStore can expand into thousands of nodes.

For More Information

For more information about Cisco UCS S3260 Rack Servers, visit http://www.cisco.com/c/en/us/_products/servers-unified-computing/_ucs-S3260-rack-server/index.html.

For more information about Cloudian HyperStore visit http://cloudian.com