Cloud Volumes Service for Google Cloud

Managed NFS Service for Enterprise applications

NFS Reference Architectures

Niraj Verma, NetApp
November 2019

Abstract

This architecture paper provides a brief overview of NFS services provided by Netapp
Cloud Volumes Service for Google Cloud.

Table of Contents

Introduction

As organizations aim to run enterprise apps in Google Cloud, or to modernize existing apps and build new ones, the available options for managing NFS requirements in the application's data layer workflows can seem limiting. Factors such as data management, high availability, scaling capacity and performance, and reliability at the right cost can create barriers to successful implementation.
Users don't want to compromise on all the application best practices they've learnt over the years by running NFS-based workloads on-premises. Public cloud should simplify the management and complexity of the data layer, while giving end users control and a seamless experience.
NetApp and Google shared this mindset when we launched our joint service: NetApp Cloud Volumes Service for Google Cloud. The service is a fully managed offering that supports both NFS and SMB-based workloads. In this document, we'll review how customers can leverage NetApp Cloud Volumes Service, the fastest storage on Google Cloud.

Why Netapp Cloud Volumes Service for NFS workloads in GCP

The following subsections outline the key benefits of Cloud Volumes Service for Google Cloud Platform.

High performance

With consistently high performance of over 400k IOPS, Cloud Volumes Service provides shared

persistent storage with high throughput and low latency. It easily meets the demands of large-scale

application environments. Some examples of applications that leverage shared files systems and

databases in their workflows are:

- Energy/oil & gas: Petrel application workflows

- Media and entertainment: Rendering and Digital Asset Management workflows

- Retail and finance: Core business applications, CRM, ECM, SAP-based applications

- Analytics and machine learning pipelines

Increased resilience with snapshots

You can easily create a snapshot of an application's volume using NetApp® Snapshot™ technology.

Snapshots act as logical backups. They're point-in-time representations of your data that allow you to

restore your database or shared file systems without downtime. You can create a snapshot manually or

schedule creation by using the Cloud Volumes Service API, gcloud CLI, or the graphical user interface (GUI).

Snapshot are fast, easy, and nondisruptive. A NetApp snapshot creates a "frozen" read-only view of a volume that enables your applications to access older versions of files and directory hierarchies without additional workflows. Snapshot creation takes only a few seconds (typically less than 1 second), regardless of the size of the volume or the level of activity within the environment.

Faster time-to-market with easy copies

Most organizations need multiple copies of their data for testing and development. Software development pipelines require multiple copies for a variety of uses; creating and refreshing those copies is cumbersome. Typically, creating copies is a time-consuming and tedious process to manage as the number of copies increases. Cloud Volumes Service for Google Cloud enables you to create a near-instant copy using snapshots. It significantly improves the release cycle from development to stage and production. The process can be scripted using Cloud Volumes Service APIs, which leads to a quicker time to market.

High availability

NetApp Cloud Volumes Service for Google Cloud is a regional service. That means application instances in any of the Google Cloud zones in each region can access the same NFS volume, without having to manually create a zonal Linux cluster that you have to manage. The regional design also leads to cost savings (avoiding unnecessary zonal egress charges) and more importantly, the service is unaffected by zonal outages. For protection from a regional outage, you can also choose to replicate the data in a cloud volume in each region to another region of your choice (egress charges will apply).

Security and encryption

NetApp Cloud Volumes Service uses at-rest encryption, relying on the XTS-AES 256-bit encryption algorithm. Cloud Volumes Service encrypts your data without compromising your storage application performance. NetApp manages and rotates encryption keys for you. This single-source solution can

increase your organization's overall compliance with industry and government regulations without compromising user experience.

Zero impact changes: average cost savings of around 70%

By using Cloud Volumes Service for Google Cloud, you can control your cloud performance by dynamically adjusting performance among three service levels. For an increase in performance, you can increase the capacity allocation (for example, 10TB provides 160MB/s); you can also choose a higher service level.

- The **Standard service level** offers economical cloud storage, at just $0.10 per gibibyte per month. It enables throughput of up to 16 MB/s for each tebibyte allocated. This level is ideal as a low-cost solution for infrequently accessed data.
- The **Premium service level** delivers a good mix of cost and performance. At a cost of $0.20 per gibibyte per month, it offers four times the performance of the Standard level, with 64 MB/s for each tebibyte allocated. This is a good fit for many applications where data capacity and performance needs are balanced.
- The **Extreme service level** provides the best performance. At a cost of $0.30 per gibibyte per month, it enables up to 128 MB/s for each tebibyte allocated, and Cloud Volumes Service can scale to deliver several GB/s for reads and writes. The Extreme service level is the best fit for high-performance workloads.

One of the unique features of NetApp Cloud Volumes Service for Google Cloud is the capability to change performance on demand without impacting the availability to the application or users. Thus, if users need Extreme performance for just two hours a day and Standard performance for the remainder, you can use API calls or a scheduler in Linux to automate that process, resulting in significant cost savings at scale.

NFS Solution Architectures

NFS service in a hybrid cloud

Often, organizations require hybrid application topology, spanning on-premises application clusters and instances in Google Compute Engine to access the same data set.
A client in an on-premises data center can access an NFS cloud volume with a Dedicated Interconnect, as depicted in the reference architecture below. Global Dynamic Routing needs to be enabled on the VPC for on-premises access, allowing the Cloud Routers to import and export custom routes that can be added.
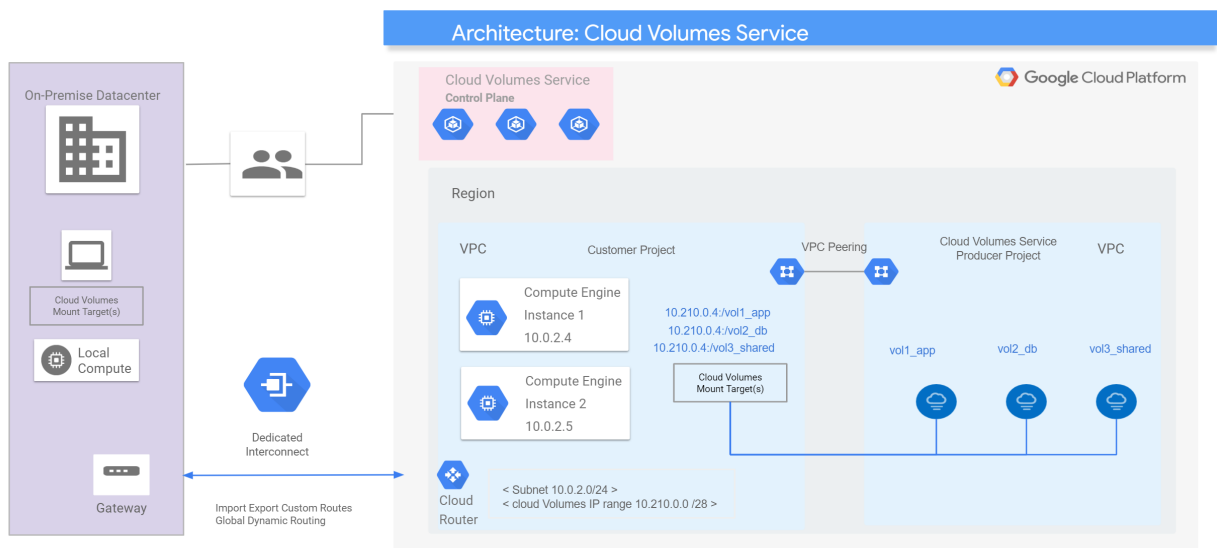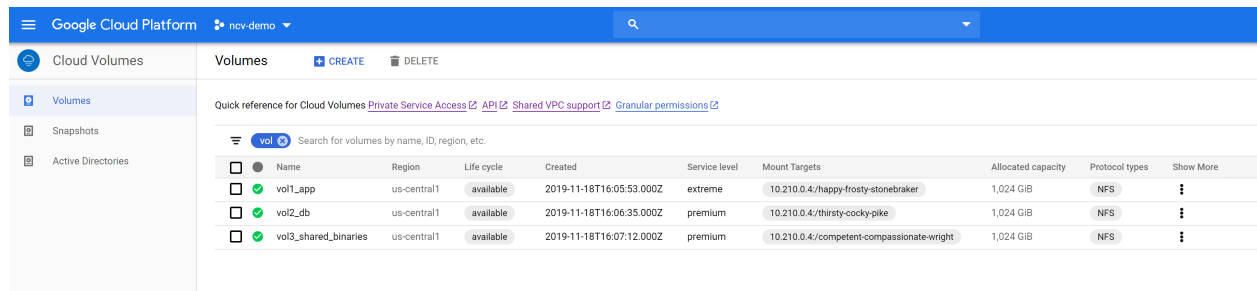

In the above diagram, you can see that we have multiple VM application instances in Google Compute Engine, VM Instance 1 and VM Instance 2.

In NetApp's producer project and VPC, we have three application volumes that were created to serve database needs, core application needs, and shared files repository.
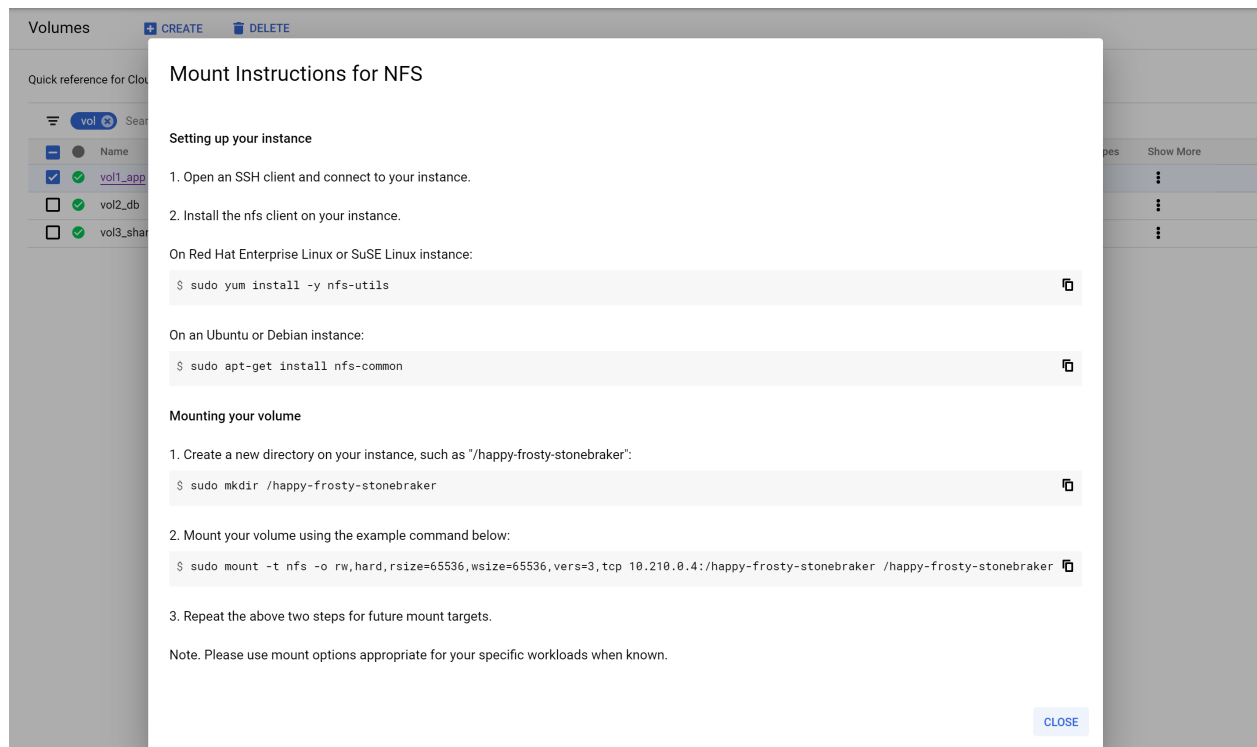
Both application instances can mount the shared NFS filesystem, which is managed by both NetApp and Google teams, at the same time. Users have control over the service level and capacity, both of whch can be changed on demand without impacting the workflow.

Users can easily mount the volumes to application instances by copying and pasting the instructions.

NFS service in Google Cloud

Users can access NFS-based NetApp cloud volumes that exist in the Google cloud landscape, even across multiple regions, in a standalone or shared VPC topology.

During the volume creation workflow, users must enable the shared VPC topology and select their host project. Compute resources in the service projects can then access the cloud volumes' mount targets through the host project.

☑ Shared VPC configuration
Provide the host project name when deploying in a shared VPC service project.

Host Project Name
ncv-beta-demo   ▾

Note: For production and business critical workflows, we recommend minimizing cross-region and on-premises access to avoid increased latency.

In the below example, you can see how multiple application instances (SAP HANA in this case) can access all the required shared binaries and transport and mount files in a secure, centralized, and cost-effective manner, running on Cloud Volumes Service.
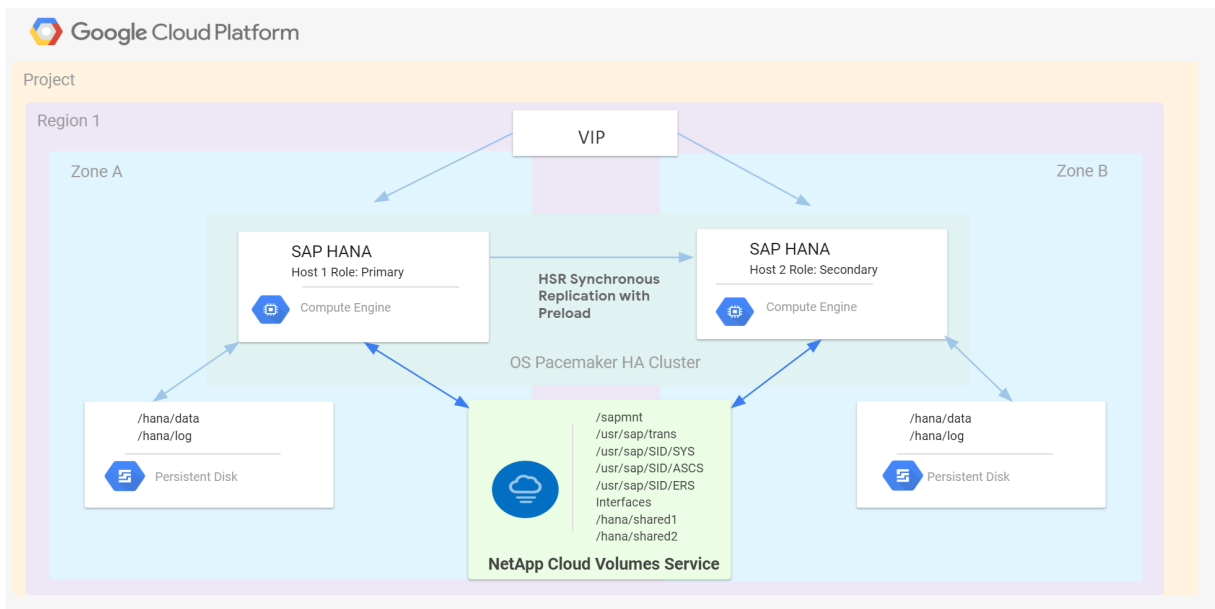
When deploying NFS-based applications, users can take advantage of the following features for increased security and automation.

Global, user-accessible API

Customers can now interact with Cloud Volumes Service via API and programmatically list, create, update, and delete objects (volumes, snapshots, for example), meaning that customers can provision cloud volumes as part of an automated application-deployment package, create application-consistent snapshots, and use other automation frameworks.

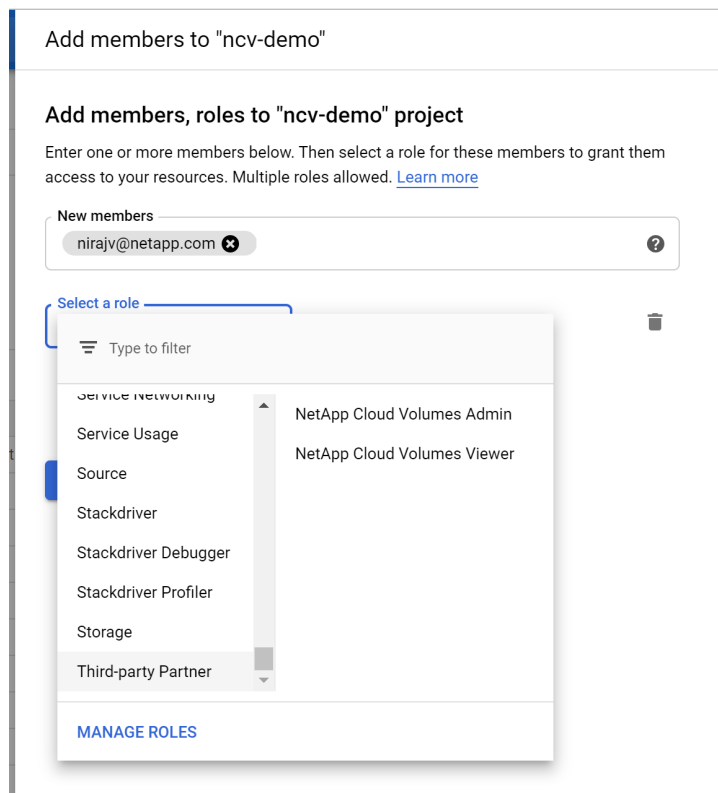The API is global, which means customers can interact with a single endpoint and specify regions as location parameters in the URL. Authentication and authorization to access the Cloud Volumes Service API is integrated with Google Cloud service accounts and IAM. See the documentation for more details.

Granular roles

To increase security for users and to enable automation via service accounts, Cloud Volumes Service supports two granular roles: netappcloudvolumes.admin and netappcloudvolumes.viewer.
These roles can be assigned to users or service accounts to perform Cloud Volumes Service actions. See the documentation for details about how to use these roles.

Add members to "ncv-demo"

Add members, roles to "ncv-demo" project

Enter one or more members below. Then select a role for these members to grant them access to your resources. Multiple roles allowed. Learn more

New members

nirajv@netapp.com ✕   ❓

Select a role

≡ Type to filter   🗑

Service Networking   ▲   NetApp Cloud Volumes Admin

Service Usage   NetApp Cloud Volumes Viewer

Source

Stackdriver

Stackdriver Debugger

Stackdriver Profiler

Storage

Third-party Partner   ▼

MANAGE ROLES

How does Cloud Volumes Compare to Google Cloud Offerings ?

	NetApp Cloud Volumes	Google Cloud Filestore	Elastifile on Google Cloud
Summary	Fully managed service Integrated directly into the GCP UI. Service is GA as of Nov. 20, 2019 Designed for scale-up workloads	Physical fully managed service in GA	**NOTE:** This service has been purchased by Google and will have its features integrated into Filestore Built for scale-out workloads
Protocols	NFSv3, SMB	NFSv3	NFSv3, SMB
Data Management • Replication • Copy • Snapshots • Data sync • Integrated backup	Yes • Replication: No (coming soon) • Copy: Yes • Snapshots: Yes • Data sync: Yes • Integrated backup: No	No	Some • Replication: No • Copy: No • Snapshots: Yes • Data sync: Yes • Integrated backup: No
High/extreme performance, low latency	Yes Standard (16MB/s) Premium (64MB/s) Extreme (128MB/s) change on demand, scales with capacity	Different clusters for different performance levels – fixed	High performance – no extreme level. Two levels: Standard, SSD.
Availability	AZ failure tolerant 99.9% (depends on region)	No	99.9%
Scale	100 TB – can change on demand Future multi PBs	Max 63.9 TB	Scales to Multi-PB
Billing/Support	Google Cloud	Google Cloud	Product will soon end its life after GC acquisition announcement.

The Cost Benefits of NetApp Cloud Volumes Service

In addition to obviating the need for infrastructure you need to manage, NetApp cloud volumes is also the lowest cost, highest quality storage solution for NFS volumes in Google Cloud. Instead of deploying and managing virtual machines, storage devices and operation systems, you can simply consume volumes. In addition, three performance tiers allow you to optimize for your workload and spending requirements. Choose from Standard, Premium, and Extreme tiers.

The table below compares using NetApp Cloud Volumes Service to renting virtual machines and running an open source Linux distribution. The "roll your own" shows the necessary doubling of the infrastructure in order to match the availability offered by NetApp.

Requirement	NetApp Cloud Volumes	"Roll your own HA File Server"
Capacity	50TiB	50TiB
Monthly Storage Costs	$5,120 (50TiB x Standard Service Level @ $0.10 per gibibyte/month snapshots included)	$17,408 (50Tib x Persistent Disk – Regional Provisioned SSD, snapshots not included)
Annual Storage Costs	$61,440	$ 208,896
Compute/VM Costs Monthly	$0	$ 401.78 (2x n1-standard-4 with 2x 375gb local SSD)
Compute/VM Costs Annual	$0	$4,821.36
TCO (yearly)	$61,440	$213,717.36
Savings	~70% savings	