

eBook

The NetApp Guide to Migrating Enterprise Workloads to Google Cloud



Introduction: Migrating Enterprise Workloads to the Cloud

Your enterprise workloads are the backbone of your business operations. Whether they are production applications, customer-facing or back office systems, databases, big data, web applications, file services, or other custom-built applications, all of them must run uninterrupted, securely, and efficiently.

Enterprise workloads are the way that the world runs, and the cloud is making enterprise workloads run better, work harder, and cost less to maintain than ever before. As companies around the world pivot to cloud-enabled IT deployments, those that still have enterprise workloads running exclusively in on-premises data centers might need more guidance about the way to move forward. For a large enterprise with diverse customer bases and needs, totally abandoning an existing IT structure might seem too risky, no matter what kind of advantages the cloud gives the company over its competitors.

Running an enterprise workload in the cloud comes with challenges: from adapting to a cloud architecture and new application process management (APM) processes to renewed focuses on data integrity, business continuity, and

cost control, moving to the cloud is not just about solving problems, it's about learning to avoid new ones. To meet these challenges, the option preferred by most companies taking early steps into the cloud is to adopt a hybrid cloud architecture for their enterprise workloads.

This handbook acts as a guide for every step of the enterprise workload migration process to the Google Cloud, from the initial motivations behind the move to orchestrating the migration and making sure of its deployment. As challenges to moving an enterprise workload present themselves, we look at ways to handle these situations, including NetApp® technologies such as Cloud Volumes ONTAP® that provide solutions to support and simplify the migration process.

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Why Should Enterprise Workloads Migrate to the Cloud?

The motivating factors behind a cloud migration are unique to every company, but behind most of them are several common key factors. There is the desire to keep pace with the technology that is being adopted by rival businesses, which allows them to scale larger while cutting costs at the same time. There is also the desire to increase business agility, cut time to market, and trade CAPEX spending for OPEX, all of which the cloud makes possible.

But that goal is at the end of a complex journey. To make sure that the migration will be a success, a careful planning process needs to be in place. Every aspect of the company's business needs and existing IT infrastructure has to be assessed so that the new cloud-based deployment can meet all of the enterprise's business needs and performance requirements. Risks have to be realistically considered and addressed.

Large enterprises might assume that the cloud won't be capable of absorbing their workloads, but the case histories show otherwise. The Home Depot is one of the largest home supply and repair retailers in the world, and as such they had a massive amount of data—15 PBs—to analyze in the cloud. [Google Cloud was able to migrate this data and quickly leverage it](#) for clear business insights using Google Cloud Big Query.

[Consider the migration case of PayPal](#). PayPal is a major online financial institution that billions of users worldwide rely on for electronic money transfers, banking, and other financial services. After breaking off from eBay, PayPal moved a number of its mission-critical applications that were on-prem to Google Cloud. But the approach to the cloud PayPal took was different: to gain flexibility, their deployment is hybrid as well as multicloud. This kind of architecture provides agility and expands the number of resources and services available to the company, but can add specific challenges when it comes to managing data across all those silos.

There are also ways that deployment in the public cloud can be assisted. McKesson, one of the largest medical suppliers in North America, [moved its SAP database workload to Google Cloud](#). But to further enhance their cloud deployment, [McKesson also took advantage of NetApp Cloud Volumes ONTAP data management technology](#).

As you can see, even the biggest enterprises with complex customer requirements and needs can make the jump into the cloud—however, the migration method and business requirements will shape specific challenges they'll face, both getting to the cloud and maintaining their applications in it. No two companies migrate the same way—even if they migrate to the same public cloud provider.

Cloud Migration Plan Challenges



Environment: Deciding which cloud (or clouds) will benefit your company the most



Complexity: Moving compute, network, and storage to a new environment



Validation: Quantifying and testing how systems will perform in the cloud



Heavy lifting: Finding the data sync and replication tools that will carry out the migration

Determining Your Workloads' Migration Requirements



No two companies have the same IT deployments, so no two companies migrate to the cloud the same way. Though every company can find increased scale, added agility, and reduced costs in the cloud, the parts of their business that are able to take advantage of those benefits differ. Before any sort of migration takes place, determining your company's requirements in the cloud has to take place.

What do these requirements look like? The initial planning stage of a migration has to identify the workloads that it is feasible to move to the cloud, because it might not be practical to move everything. The user base and the rate of usage for each workload that you plan to move need to be identified. Your customers or users are affected by the move if you don't plan to meet their usage needs during the shift, so you need to make sure the migration affects users as little as possible.

This is also the stage to determine network configurations. Your network might have interdependencies with the workloads you plan to move that might be affected by a transition to the cloud. Another major factor is costs. The three cost components of compute, storage, and networking must be calculated. However, because the storage component is the one that grows on a constant basis, minimizing storage costs should be a key consideration when planning the move.

Probably the most important factor to determine in this early stage is how available you need your workloads to be. Do you require your workloads to be highly available? Two factors come in when addressing your workloads' availability: one is your recovery time objective (RTO), and

the other is your recovery point objective (RPO). These numbers represent the amount of time that it takes your business to recover from failure with acceptable losses and the point in time your business can operate without its data, respectively. For critical enterprise workloads, these numbers most likely need to approach zero. These numbers determine the shape that your high-availability, disaster recovery, and business continuity plans take, which most likely are also supported by the cloud.

Another important factor is your business protection requirements. Is protecting your workload data a key requirement? In disaster recovery (DR), secondary copies of data are crucial to making sure that your workloads can be restored in case there is ever a catastrophic event (such as a natural disaster, ransomware attack, or hardware failure). Your workload needs to be able to failover to a secondary site if and when such events occur and be able to fail back when the primary site is up and running again, keeping in mind all of your stated service-level agreements (SLAs).

Requirements that the business has in regard to meeting SLAs for users must also be considered here. There might also be compliance and regulation guidelines that your business is expected to follow, such as HIPAA in the health industry and FISMA at the U.S. federal government level.

At this stage you also choose your cloud service provider—Google Cloud.

Key steps for determining the shape of an enterprise workload migration:

- Make an inventory of workloads you consider moving to the cloud.
- Identify usage base.
- Calculate compute, network, and storage costs.
- Determine security and recovery needs, including SLAs and RTO/RPO points.
- Research legal implications (that is, compliance).
- Choose your cloud provider.

The Type of Migration: Choosing a Method

After you have determined the needs of your enterprise workload in the cloud, it is time to determine the type of migration that best meets those requirements. Currently there are two main routes that your migration can follow: infrastructure as a service (IaaS) and platform as a service (PaaS). IaaS uses cloud-based virtual machines that customers can use and configure on their own as they see fit in terms of runtime, operating system, and middleware. With PaaS, those virtual machines are configured by the cloud provider itself and then offered to the customer.

It's common in cloud culture to consider six migration strategies for applications:

Retire will see the application and workload reach the end of its life

Retain keeps the application in the data center, with no move to the cloud (currently)

Rehost also known as the “lift and shift,” moves the application intact to run on cloud resources

Replatform the code that runs your workload is slightly modified to meet the cloud deployment requirements

Repurchase involves moving to a cloud-based SaaS product over the existing application

Refactor requires a complete code rebuild of the application to fundamentally take advantage of the cloud.

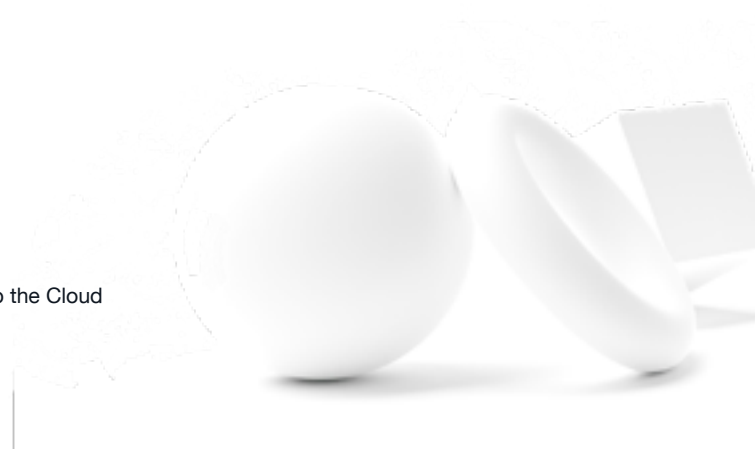
Retiring and retaining don't get the application to the cloud, so we'll focus on the four options that take existing workloads and can go between the IaaS and PaaS

categories: rehost, replatform, refactor, and repurchase. With IaaS you can rehost (“lift and shift”) or replatform (“lift, tinker, and shift”), and with PaaS you can refactor or repurchase.

The PaaS options are different. With refactoring, your workload code is run on your cloud provider's service. The drawback here is that you might lose some of the functionality that you once had, because the cloud provider infrastructure differs from your own. An additional drawback to a refactoring is that you need to recreate your APM processes. A refactoring means rewriting the code for your application from scratch, which aligns your workload most closely to the cloud provider's services. However, a rebuild might also mean vendor lock-in with that provider. Repurchasing means scrapping the application you have previously worked with in favor of a provider's SaaS offering. While this option may take less time than a refactor, it comes with the same potential loss of existing functionality, in addition to totally giving up control over the application itself.

Between these four options, the fastest way to get an enterprise workload into the cloud and running is to go with “lift and shift” rehosting. A refactoring rebuild is obviously the most costly, risky, and time-consuming form of migration.

Another step to take at this stage is to build the leadership team that is responsible for carrying out the migration. This team can be selected from cloud supporters within the organization, or it can be done with the help of a managed service provider. This team has to work closely with leaders in departments all around your company, from the IT department to marketing and sales teams, so it is important that the team includes point persons who can relay the migration plan's goals and needs in each field.



The cloud provider that you choose should also be consulted, because it can assist your move. [Google Cloud has expert teams](#) that are available to give advice and help you reorganize your architecture for cloud deployment, with security and compliance needs in mind. For existing NetApp storage system users, [turning to NetApp at this time is highly advantageous](#). NetApp has cloud solutions such as Cloud Volumes ONTAP that work seamlessly with on-premises storage systems already in use at your data centers. Determining how to best transition those resources is an important decision that NetApp can help you make. If you use other third-party solutions, look into their availability on your cloud provider's marketplace. They might have compatible cloud versions to use in your transition, but their use might also affect your existing agreements.

Key points to consider as you choose a migration method:

- Choosing the model that works best for your enterprise workload
- Cloud leadership team: finding the personnel who can best manage the transition
- Cloud provider migration resources and planning
- Planning how existing infrastructure and third-party solutions map out in the cloud

Testing the Workload

Testing how your workload runs in the cloud is the next important step in the migration. Here you should build a proof-of-concept model that allows you to see what the real costs of operating the cloud are and validate that the workload performance is acceptable in a test environment. This testing is to plan for the correct amount of services you require to run efficiently, also known as “tuning.”

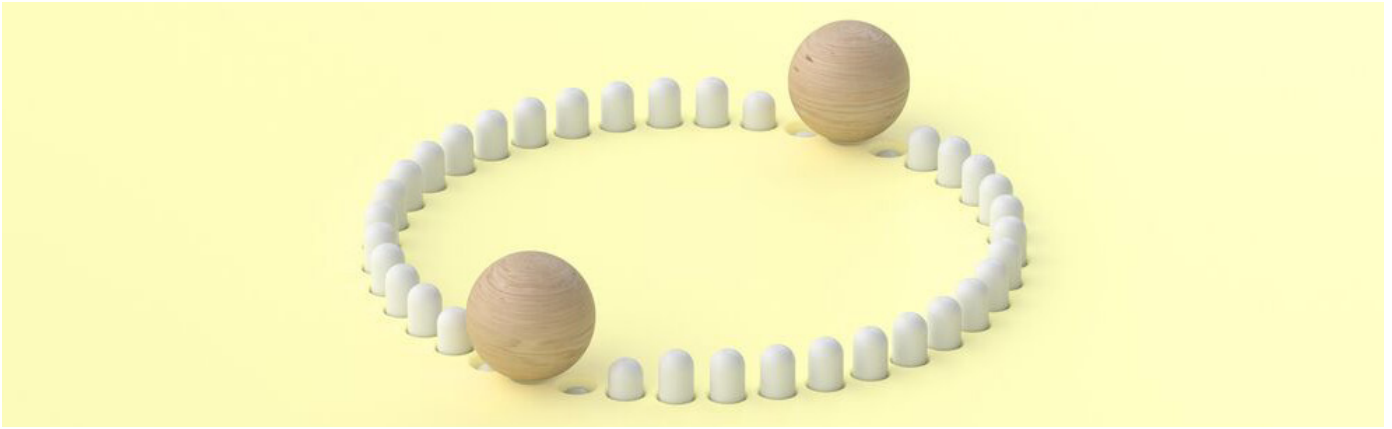
It is outside the scope of this handbook to detail the exact differences between all of the storage formats, compute types, databases, and networking services available on Google Cloud, but it is important that you are aware of them before you start your migration planning. Understanding what your provider offers makes it clear whether or not your existing solution is integrable or upgradable in these regards. [You can find a full list of the cloud products available from Google Cloud here.](#)

Security is another concern to address during the testing process. It isn't easy for many enterprise companies to accept that their infrastructure partially or even entirely exists under the control of some other company. There should be no gap between the level of security that you currently use and the security you need to set up in the cloud. If anything, the migration should be a chance to increase your security levels by considering additional security tools such as [Google Virtual Private Cloud](#).



Key points at this stage:

- Figure out the total amount of storage and compute your workload needs
- Determine your expected cloud costs
- Put your workload through tests
- Set security guidelines and control parameters



Finding the Right Migration Solutions

This is where the heavy lifting gets done: the migration solutions necessary to bring an enterprise workload into the cloud need to be powerful. Deciding on the wrong solution can set back the migration and even lead to further headaches.

There are multiple ways to move data to the cloud. Some are native to the cloud service providers, others are open source, and there are also third-party vendor solutions and services. There are also solutions unique to specific use cases, such as databases and virtual machines. Migrating data files is one of the most critical and challenging moves that has to be orchestrated. When it comes to data, not only does the initial migration have to be considered, but also keeping that data up to date and in sync with sources on the premises and in backup locations. Time and costs are real factors to consider.

Database migrations, for example, can be done with the help of cloud-native services such as Google Cloud's fully managed [Google Cloud SQL](#) and [Cloud Spanner](#) services.

For the largest migrations—for data that exists on a scale that would take years or even decades to transmit electronically—Google Cloud Platform provides offline bulk data transfer services in [Google Cloud Transfer Appliance](#).

As the actual migration takes place, it is important to make sure that there is no interruption of normal business for your workloads. Data must continue to be accessible to all customers, and updates to existing data must continue to

take place as normal. The process should be carried out as quickly as possible, but can effectively be broken down into phases that see each workload element successfully migrated and validated before moving on to the next. You'll also need to find a way to synchronize changes that are made to the source data while the migration is ongoing. A good way to manage the task is to employ data management solutions that can be found on your respective public cloud's marketplace. Existing NetApp users benefit from having Cloud Volumes ONTAP, which extends enterprise-level on-premises storage into the cloud through NetApp SnapMirror® technology. In the next section we'll look in detail at what Cloud Volumes ONTAP and NetApp can offer enterprises migrating workloads to the cloud.

Key points to have in mind before migration day:

- Find the right solution to carry out the migration and provide support during the move
- Have plans in place for when the migration takes place, including contingencies for if things go wrong
- Test as you go to make sure that everything works

NetApp Solutions for Migrating Enterprise Workloads to the Cloud

Because migrating an enterprise workload to the cloud requires massive amounts of orchestration and support, many companies turn to solution providers such as NetApp to aid in the migration and for continued data management and support of their enterprise workloads.

[NetApp Cloud Volumes ONTAP](#) offers enterprise businesses a way to seamlessly transition their workloads into the cloud. Utilizing SnapMirror, Cloud Volumes ONTAP replicates files from on-premises NetApp storage systems and brings them into the cloud. Available on AWS and Azure as well as on Google Cloud Platform, Cloud Volumes ONTAP is an interface similar to the one that longtime NetApp storage system users are familiar with using, except now all of that functionality has been updated for performance in the cloud. With the ability to support SMB and NFS file shares, and iSCSI SAN storage, enterprise workloads can effectively leverage the cloud for all of their business demands.

[NetApp® Cloud Volumes Service for Google Cloud](#) (CVS for GCP) is a fully managed GCP cloud-native file storage service that provides NAS volumes over NFS and SMB with all-flash performance. The service is integrated with Google Cloud console and accessed via NetApp Cloud Manager and REST API.

CVS for GCP simplifies how you migrate and run enterprise workloads in Google Cloud with out-of-the-box capabilities such as file sharing, multiprotocol support, high availability, data protection, and more.

At the enterprise level, data management requires a seamless way to orchestrate the cloud environment from a single pane-of-glass, where resources can be easily launched and deployed with the click of a button. For that, Cloud Volumes ONTAP comes with [NetApp Cloud Manager](#), the NetApp automation, orchestration, and management GUI. From Cloud Manager, tasks can easily be carried out through a drag-and-drop interface that connects,

discovers, and manages resources throughout your deployment, both on premises and in the cloud. Scheduling, monitoring, and alert tools are all accessible through a single interface, so migration and maintaining a cloud deployment do not mean a difficult management process.

[Cloud Sync](#) is another NetApp solution for migrating data (from systems other than ONTAP) to the cloud. As a file transfer solution for companies migrating data to the cloud, Cloud Sync offers much more than open-source tools such as rclone and rsync, because it comes with a service's robust set of features. With automation for ongoing file transfers, parallel processing for the fastest transfer speeds, and data protection that never takes the data out of your security boundaries, Cloud Sync turns the movement of data into a task that companies can expect to be done affordably and quickly.

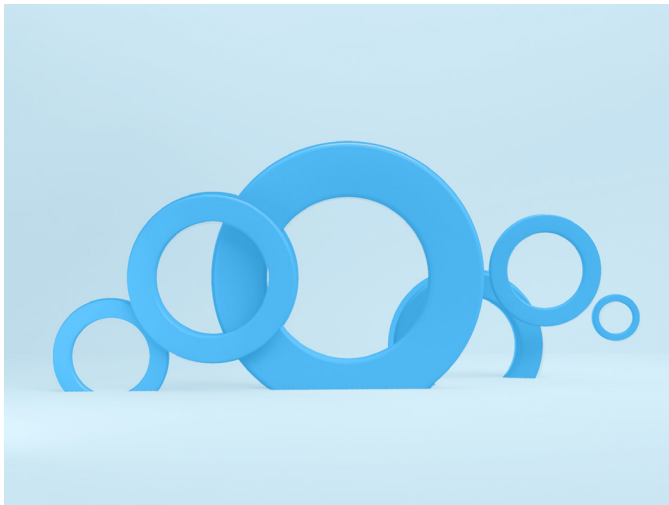


Cloud Volumes ONTAP: Key Features

Cloud Volumes ONTAP has a suite of features that make deploying enterprise workloads using the cloud easy, cost efficient, and safe, including:

-  **High availability.** Two-node high availability with Cloud Volumes ONTAP makes sure that when your enterprise workload faces an outage, the redundant node takes over, keeping your RPO at zero and RTO below 60 seconds.
-  **Data Mobility.** [SnapMirror® data replication](#) seamlessly transfers data from on-premises or other clouds, avoiding vendor lock-in. SnapMirror also helps to set up and continuously synchronize DR data copies.
-  **Data protection.** Cost-effective [NetApp Snapshot™](#) copies and seamless [disaster recovery capabilities](#) keep your files safe from failures or data corruption.
-  **Hybrid and Multicloud.** Cloud Manager gives users a single pane of glass to seamlessly manage, maintain, and monitor resources that span environments on AWS, Azure, Google Cloud, and the data center with drag-and-drop functionality or API calls.
-  **Automation.** [RESTful API calls](#) allow developers to treat Infrastructure as Code (IAC), speeding up the dev/test workflow and cutting down TTM.
-  **Storage efficiencies.** Cloud Volumes ONTAP makes it possible to cut down on cloud storage costs through the use of [several storage efficiency features](#), including thin provisioning, data deduplication, compression, and zero-capacity data clones.
-  **Data tiering.** Automatic tiering of “cold” data between highly performant disk storage to less-expensive object storage on Amazon S3, Azure Blob, or Google Cloud Storage saves costs and optimizes storage.
-  **Multiprotocol Access.** Access to storage over protocol of choice—NFS/SMB/ iSCSI—allows the same storage service to be configured and used for file share as well as block storage use cases.
-  **High Performance.** Enhanced storage throughput through features like WAFL and cloud data caching, best suited for performance intensive production workloads.
-  **Kubernetes and Containers Integration.** With NetApp Trident, Cloud Volumes ONTAP can be used to automatically provision persistent storage for stateful applications stored in Kubernetes and other containerized environments.
-  **Security and Safety.** Cloud Volumes ONTAP augments and integrates with the cloud provider storage features like encryption at-rest and in-transit, VNET integration for perimeter security, ransomware protection, and cloud WORM (write once, read many) storage
-  **Compliance.** The AI-driven Cloud Compliance add-on scans all your data in order to map, identify, and report on sensitive private data that could fall under regulatory scope of GDPR, CCPA, and other data privacy legislation.

The Final Stage: Keeping Tabs on the Cloud



The cloud is always changing. It's one of its biggest features, but also a concern for enterprise businesses that have to keep up. The upkeep of your cloud deployment requires constant monitoring and awareness of these changes. Make sure that you have round-the-clock support both for your resources with the cloud provider and with your own deployment.

Your SLAs with the cloud provider should be carefully monitored. SLAs are contract-bound expectations of service that cover everything from compliance to security and performance. Not every product from the same provider has the same SLA, and it is important to be aware of these.

Keeping tabs on the cloud means employing monitoring services. Google provides [Cloud Monitoring](#), which aims to help users monitor their cloud deployments, as well as identify and diagnose issues. NetApp users can also turn to Cloud Insights to get in-depth analysis into the performance of their cloud services and applications, not just the storage level.

DR is another long-term planning goal for operating in the cloud. Before the advent of the cloud, disaster recovery for enterprise workloads meant maintaining secondary and sometimes even tertiary physical backup sites to make sure of data safety and compliance. The cloud still provides that

level of redundant protection, but in this case, you no longer have the outlays of real estate, maintenance, orchestration, security, and environmental controls involved with running the backup sites. Data stored for backup purposes in the cloud can be ready to use within seconds of a disaster scenario, making sure of business continuity when you would otherwise be in danger of missing your RPO and RTO. Cost control is the main concern when it comes to storing data for DR, and Cloud Volumes ONTAP is designed specifically to do that. With storage efficiencies; easy replication to your backup sites using SnapMirror; and tiering cold data to inexpensive object storage until it's needed, Cloud Volumes ONTAP can play a crucial role in maintaining a cost-effective DR plan.

Enterprise workloads have a particularly challenging set of requirements, most of which have to deal with their scale. The sheer amount of data that has to be stored can eat up an entire IT budget. Managing to keep these costs as low as possible is an ongoing task for any enterprise workload in the cloud. More than just business continuity, your industry might have compliance requirements and regulations that demand a level of redundant storage for certain types of data, no matter how much that costs your company. Once again, a solution such as Cloud Volumes ONTAP makes meeting these goals achievable and effective.

Points to keep in mind moving forward in the cloud:

- Be ready to adapt to constantly changing platform updates
- Provide vigilant system monitoring and upkeep
- Keep on top of SLAs to make sure you always get the performance you pay for and require
- Adjust solutions to keep storage and disaster recovery costs at a minimum

Google Cloud Migration Case Studies with Cloud Volumes ONTAP

Cloud Volumes ONTAP is an enterprise-grade storage solution which augments enterprise-grade applications, DevOps operations, file services, and disaster recovery. Based on NetApp's vast experience, it delivers solutions to enhance performance, dramatically reduce costs, boost security, and accelerate cloud migration for workloads in Google Cloud.

Let's dive into some notable Google Cloud case studies with Cloud Volumes ONTAP.

Global Healthcare Services and Products Company

Ranking among the top of the Fortune 500 companies, this UK-headquartered global healthcare services company provides tailor-made solutions across the medical industry which connect patients, providers, payers, and other stakeholders to provide integrated care coordination and patient management. With about 50,000 employees in 46 countries, the company serves hospitals, health systems, laboratories, surgery centers, pharmacies, and physician offices around the world.

The company wanted to accelerate its cloud-first strategy and migrate its on-premises legacy systems to the public cloud. For this, the healthcare giant needed a storage platform which enables easy data transfer between on-premises and the public cloud. The solution also needed to accommodate the company's multicloud approach, which included AWS as well as Google Cloud.

Once the healthcare giant started using Cloud Volumes ONTAP it gained numerous benefits:

- Seamless migration of their mission-critical financial applications' data on a tight migration deadline using NetApp SnapMirror and [Cloud Sync](#).
- Automatic storage provisioning [using Cloud Manager](#).
- [Multi-protocol file shares access](#) for both SMB/ CIFS and NFS workloads.
- [Persistent Kubernetes storage](#) allocation via Cloud Volumes ONTAP and NetApp Trident.



Multinational Investment Bank and Financial Services Company

Based in New York City, this American multinational financial company is one of the biggest investment banking enterprises worldwide. It uses its long-standing experience to deliver an extensive portfolio of services including asset management, securities underwriting, prime brokerage, and investment management.

The company has had a strong interest in cloud computing in the last few years. Its mission-critical workloads perform investment analysis on a regular basis which require considerable compute resources. For this purpose, the company needed a solution that would leverage a large number of computer nodes on Google Cloud.

The company was looking for a highly automatic solution that would require minimal modifications and support its cloud strategy. The company was already using NetApp FlexCache as a central feature of its on-premises NetApp architecture. This technology enables remote caching

that simplifies file distribution and helps scale storage performance, among other advantages.

Using Cloud Volumes ONTAP, the company can now leverage FlexCache in Google Cloud as well, along with experiencing additional benefits:

- Automated storage framework for Cloud Volumes ONTAP and [Cloud Manager using Terraform](#).
- [Excellent security features](#) to meet the company's strict security standards.
- The ability to incorporate [Cloud Volumes ONTAP to support managed services](#) they offer their own customers.



American Multinational Investment Bank Hedge Fund

This hedge fund division belongs to a multinational investment bank and financial services company which identifies, models, and trades global financial markets by leveraging research, technology, and automation. The division uses cutting-edge technology to formulate risk models for their clients, powered by Google Cloud's elastic grid computing.

The team wanted to find a way to perform its existing research analysis and simulation processing in Google Cloud. This required mirroring the primary on-premises data in Google Cloud. For elastic scaling and burst consumption they needed an NFS platform on Google Cloud that is scalable, easily managed, and integrates into their existing automation frameworks and processes.

Cloud Volumes ONTAP was the perfect solution to meet their needs and led to some major benefits:

- Quick set up using [Cloud Manager's drag-and-drop capabilities](#).
- Seamless replication of data from on-premises to the cloud and back using SnapMirror.
- Integration with existing automation tools through the Cloud Manager API.
- Storage efficiencies that reduce [cloud data storage costs](#) of a massive 80 TB dataset.



Summary

This handbook provided a good idea of what can happen along the way to bringing an enterprise workload into the Google Cloud Platform. Hopefully with the answers you found here, you'll be able to make the next steps toward the cloud. For every step of the enterprise workload migration process, we've also shown how NetApp has a solution that is proven to help make the transition safe, cost-effective, and fast.

Migrations pose tough challenges that can be met with a careful strategy and the right resources at hand. With NetApp solutions such as Cloud Volumes ONTAP, Cloud Manager, Cloud Sync, and Cloud Insights, you'll find the service and solution you need to effectively make the transition of your enterprise workload to the cloud a success.

Start a free trial today with Cloud Volumes ONTAP in Google Cloud

[Start now](#)



Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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