NetApp®

EBOOK

The NetApp eBook to
Migrating Enterprise Workloads to the Cloud

The NetApp eBook to
Migrating Enterprise Workloads to the 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 uninterruptedly, 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 on the premises 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 public cloud using AWS, Azure, or any other cloud provider, 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 that provide solutions that can support and simplify the migration process such as ONTAP® Cloud.

Why Migrate an Enterprise Workload to the Cloud?

The motivating factors behind a migration are unique to every company, but behind most of them are several 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.

The migration won't work without careful planning. 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 needs and performance requirements. Risks have to be realistically considered and addressed.

The migration has three major components that have to take place within your plan's time frame:

- The enterprise's compute, network, and storage must be moved to the new environment.
- Setting up systems in the cloud has to be quantified and tested.
- Tools for data syncing and replication that carry out the movement of data.

Large enterprises might assume that the cloud won't be capable of absorbing their workloads, but the case histories show otherwise. One example of a company that made a major shift to the cloud was Philips. Known primarily for its lighting and appliance branches, Philips also does significant work in the healthcare industry. The switch of Philips to the cloud brought 15PB of patient data into AWS and increased the company's application performance, scale, and reliability. Due to regulations in place to safeguard sensitive information—in this case, information such as medical records—migrations such as that of Philips can be particularly challenging. Geico is an example of a major enterprise moving to Azure cloud services. By moving to a DevOps culture and shifting development to Azure, the insurance giant was able to increase its availability, cutting down the release time for new features and lowering operational costs throughout its business. What these examples show is that even the biggest enterprises with complex customer requirements and needs can make quick and efficient moves to the cloud without putting their businesses at risk.

Determining Your Workload 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.

Determining Your Workload Migration Requirements

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. Your choice of cloud provider factors into these and every decision that you make when it comes to your cloud migration. Though a comparison of the major providers is outside the scope of this handbook, weighing the services each provides, and the quality of those services is another early decision that your company has to make moving forward.

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 service provider itself and then offered to the customer.

According to AWS, there are four ways that migrating your existing workload can go between the IaaS and PaaS categories: rehost, replatform, refactor, and rebuild. With IaaS you can rehost ("lift and shift") or replatform ("lift, tinker, and shift"), and with PaaS you can refactor or rebuild. Rehosting, or a "lift and shift" migration, is when the existing on-premises setup is redeployed "as is" on the IaaS. Replatforming or revising is when the code that runs your workload is modified to meet the cloud deployment requirements.

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 rebuild 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.

Between these four options, the fastest way to get an enterprise workload into the cloud and running is to go with a "lift and shift" rehosting. A rebuild is obviously the most costly, risky, and time-consuming form of a 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 Type of Migration: Choosing a Method

The service provider that you choose should also be consulted, because it can assist your move. Cloud providers have 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 ONTAP Cloud 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
- Service 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 that the different cloud service providers make available, but it is important that you are aware of these numbers. Azure has recently published a handy guide to recognizing the differences between their services and those on AWS that gives some idea of what is available as you begin your research. Understanding what your provider offers makes it clear whether or not your existing solution is integrable or upgradable in these regards.

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 Amazon VPC and Azure's network security groups.

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 Tools

This is where the heavy lifting gets done: the migration tools necessary to bring an enterprise workload into the cloud need to be powerful. Deciding on the wrong tool 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 tools and services. There are also tools 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 tools such as AWS Database Migration Service (DMS) for moving to Amazon RDS from MySQL, MS SQL, or PostgreSQL and Azure database migration, which can move SQL Server or on-premises Oracle DBs to Azure's SQL options. For even larger migrations—for data that exists on a scale that would take years or even decades to transmit electronically—AWS offers AWS Snowball, Snowball Edge, and AWS Snowmobile. As of this writing, Azure doesn't offer any comparable service for migrations of that size.

Finding the Right Migration Tools

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 tools that can be found on your respective public cloud's marketplace. Existing NetApp users benefit from having ONTAP Cloud, 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 ONTAP Cloud and NetApp can offer enterprises migrating workloads to the cloud.

Key points to have in mind before migration day:

- Find the right tools 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 ONTAP Cloud offers enterprise businesses a way to seamlessly transition their workloads into the cloud. Utilizing SnapMirror, ONTAP Cloud replicates files from on-premises NetApp storage systems and brings them into the cloud. Available on both AWS and Azure, ONTAP Cloud 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 CIFS, NFS, and iSCSI file shares with NAS and SAN storage, enterprise workloads can effectively leverage the cloud for all of their business demands.

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.

NetApp Solutions for Enterprise Workloads in the Cloud

ONTAP Cloud 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 ONTAP Cloud makes sure that when your enterprise workload faces an outage failover to a secondary site, you can do so, keeping your RPO at zero and RTO below 60 seconds.

Data protection.
Cost-effective Snapshot™ copies and seamless disaster recovery capabilities keep your files safe from failures or data corruption while maintaining regulatory compliance.

Snapshot automation.
This capability makes creating and storing these crucial backup files easy and cost-effective.

Storage efficiencies.
ONTAP Cloud makes it possible to cut down on storage cost through the use of several storage efficiency features, including thin provisioning, data deduplication, and compression.

Data tiering to Amazon S3. For ONTAP Cloud users on AWS, automatic tiering of "cold" data to and from Amazon S3 saves costs on data that you access less frequently, such as DR or Snapshot copies.

Taken together, these features all combine to help make an enterprise workload storage solution that can help your business effectively transition to and master the cloud.

At the enterprise level, data management requires a seamless way to orchestrate the hybrid cloud environment from a single pane-of-glass, where resources can be easily launched and deployed with the click of a button. For that, ONTAP Cloud comes with OnCommand® Cloud Manager, the NetApp automation, orchestration, and management GUI. From OnCommand 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 the 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.

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. The SLA for Amazon EC2, for example, clearly says that every reasonable effort will be made by AWS to provide the service at a 99.95% availability. That in itself is not a guarantee, and that is where monitoring on your part has to take place.

Keeping tabs on the cloud means employing monitoring services. On AWS there are CloudTrail and CloudWatch, while Azure provides this service through Azure Application Insights and Azure Monitor. NetApp users can turn to OnCommand Cloud Manager for additional insights into the performance of their cloud services and performance.

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 ONTAP Cloud is designed specifically to do that. With storage efficiencies; easy replication to your backup sites using SnapMirror; and, on AWS, tiering cold data to inexpensive storage on Amazon S3 until it's needed, ONTAP Cloud can play a crucial role in maintaining a cost-effective DR plan.

The Final Stage:
Keeping Tabs on the Cloud

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 ONTAP Cloud 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

Summary

This handbook provided a good idea of what can happen along the way to bringing an enterprise workload into the cloud, either on AWS or on Azure. 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 ONTAP Cloud and Cloud Sync, you'll find the service and solution you need to effectively make the transition of your enterprise workload to the cloud a success.