



5 PHASES FOR **ENTERPRISE** **MIGRATION TO AWS**



Executive Summary

When migrating to the cloud, companies need to develop a migration strategy that assesses risks and considers all possibilities. For example, if your data center lease is up and you need to move to the cloud, how can you move quickly without changing the way you're used to working? And how can you get your infrastructure organized in a way that will enable you to utilize a 'lift and shift' ('forklift') move?

Moving an entire service to a new IT environment means deciding how to migrate all three sub-systems: compute, storage and networking. This involves identifying the right components and capabilities of the new environment, as well as the tools that will support migration tasks including replication of resources and data syncing. Planning for long-term, IT also needs to ensure business continuity with the right ongoing operational plan.

At last year's AWS re:Invent, Amazon Cloud CEO Andy Jassy described how going all-in to the public cloud is the "destination" for many enterprises. Others will say that hybrid clouds are the future.



The cloud migration discussion is not about if it will happen, but rather about what is already happening and what the required resources, skills and procedures are for transitioning smoothly to best fit the Amazon Cloud to their needs.



In this paper, we'll provide a comprehensive five-phase approach for a smooth enterprise grade Amazon cloud migration project. We'll cover everything from compute to data migration to protection, and discuss how to best handle these challenges when moving your enterprise to the Amazon Cloud.



Learning From Past AWS Migrations

So how do companies successfully migrate to the Amazon Cloud? Fortunately, there are some great examples of large enterprises that have achieved this type of migration with flying colors. [GE](#), for example, is migrating more than 9,000 workloads to AWS, while reducing their amount of data centers from 34 to four over the next few years. One challenge during the GE migration was that some of their core industries – such as healthcare and finance – are heavily regulated by protocols that were written for past eras. These protocols assume a server and a physical data center that you control.

GE is not the only example, however. [SoundCloud](#), a platform for creating recordings or uploading existing sounds, was able to utilize various AWS solutions to store and process the massive data sets its users upload each day.

Through the use of [Amazon S3](#) and [Amazon Glacier](#), SoundCloud securely stores data volumes without worrying about storage or additional operational overhead. And as their VP of Engineering Alexander Grosse pointed out, the key with the migration was starting right away in the AWS Cloud, and setting up their architecture in a more modular and scalable way right from the start.



When enterprises move to the cloud, timing is of the essence. Enterprises need to move quickly, while moving away from cumbersome, costly and risky traditional IT projects.



1. The Discovery Phase

So how did these companies get started with their AWS migrations? While every case is different, they were all looking for scalability, convenience, and cost efficiencies.

These aspects can be identified as early as the initial discovery phase. It's here where enterprises can better understand things like which applications can be moved and which cannot, and the frequency of users and usage and who they are.

Network configurations and interdependencies are also important to consider when migrating apps to the cloud, along with integration with external systems. Other factors to consider in the discovery phase include SLA requirements that relate to the availability required to have a clear definition of the [RTO](#) and [RPO](#) of your systems.

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This will allow you to understand what you need from the perspective of both scalability and a secondary site.

Your industry may also have certain compliance standards and regulations that you'll need to consider; for example the Health Insurance Portability and Accountability Act (HIPAA) in healthcare, or PCI-DSS for organizations that handle credit card payments.

One of Amazon's strengths in these areas is its ability to meet [a wide variety of compliance standards](#) that satisfy both US and global regulations. In this phase make sure you understand your side of the [AWS shared responsibility model](#), since your users' liability won't vanish in the cloud.

2. The Assessment Phase



At the assessment stage, you can start to select your migration method. As [Gartner's past analysis](#) states, when migrating to IaaS you can either rehost (i.e., redeploy applications on an IaaS without making changes), or revise (i.e., modify or extend the existing code to fit the cloud environment).

At this stage, you can also start to build your migration team and identify the resources you'll need. Whether you do your migration in-house or outsource it to a cloud managed service provider (see this resource for [migration partner consultants](#)), there should be good communication between your on-premise system admins and the new public cloud team.



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It is also recommended to get in touch with Amazon, and leverage AWS [enterprise accelerators](#) that can help you acquire the skills required to get things started.

For example, their team of solution architects can help you plan your architecture topology in the cloud, to comply with your security and compliance requirements. And recently, AWS Professional Services has built a focused team of experts called the [AWS Professional Services Mass Migration Team](#), which is focused specifically on helping enterprises with large migrations to the cloud.

In addition to AWS consulting partners, you should map the third party solutions that you already use on your premise, and learn if these can easily migrate to Amazon.

You can start by checking the [AWS Marketplace](#) to see if the vendor is an Amazon partner, and if they already have ready-made images or integration points to be easily deployed on Amazon. In most cases, that also means you can bring your own on-premise license, and not even need a license at all.

3. The Proof of Concept (POC) Phase



The POC phase is when you'll test your workload. This should include any tests for validating the workload performance and the costs for running on the cloud.

This phase is where you can determine the capacity required in terms of the amount and size of your instances, for example.

As part of that you'll need to understand AWS storage services benefits and limitations, in order to determine if you'll be able to utilize them to replace or integrate with your on-premise repositories. This could mean leveraging RDS to run your SQL database or Glacier to keep your archived data.



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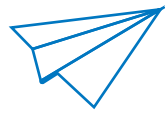


Understanding your security requirements is also crucial at this stage. Shifting to the cloud means losing the ability to manage your physical security. If you fail to match your existing security controls with equivalent ones in the cloud, it could lead to breaches, data exposure and compliance violations - or worse.

One way to keep an eye on security is to determine which network and security controls are needed and leverage Amazon's built-in firewall, which offers a basic level of intrusion protection and may be sufficient in certain cases.

Additionally, [Security Groups](#), [Amazon VPC](#) and dedicated tunnels such as [AWS Direct Connect](#) will allow you to protect your public cloud network as well as securely move applications and data in and out of your on-premise data center.

4. The Migration Plan Phase



Once you decide which applications to migrate, move on with a complete plan consisting of the blueprint design, the migration tools, a list of assignments and rollback, 'what-if' procedures.

Over the years Amazon has introduced multiple migration-related tools.

This set of tools starts from the option to move a single VM using the [import/export tool](#), and continues with the [vCenter specific connector](#), which facilitates migration of VMWare resources.



The plan should also consider the data migration, which requires consideration of the amount of data involved and its synchronization with your on-premise data repositories.



Your data should be migrated in a reasonable amount of time, with a list of tools you can use to help automate the move.

When dealing with databases you will find several tools, including the [AWS Database Migration Service \(DMS\)](#), which will help you migrate your relational databases such as your MSSQL, MySQL, and PostgreSQL, to a dedicated EC2 instance or directly to Amazon RDS, the managed Amazon DBaaS offering.

In addition, you can use the [AWS Schema Conversion Tool](#) to migrate between different database platforms.

This tool will convert all your schemas and stored procedures. And if you have large chunks of data that need to be migrated, look at [AWS Snowball](#) and [Snowball Edge](#).



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There will be a one-time move of the data on “production day”, as well as continuing to sync the data between the environments as required.



You should also look at [AWS marketplace storage solutions](#) that can help keep data in sync at all times.



For example, NetApp users can replicate their on-premises data to Amazon using [ONTAP Cloud](#), which is based on [NetApp's SnapMirror](#) technology.

Speed is of the essence in this phase, but it's important to start small and prove value.

A phased approach will be most successful, where you move each application and test each one extensively, and validate reliable data replication and user experience.

And remember, a rollback is not a failure; it is totally reasonable when using on-demand cloud resources.

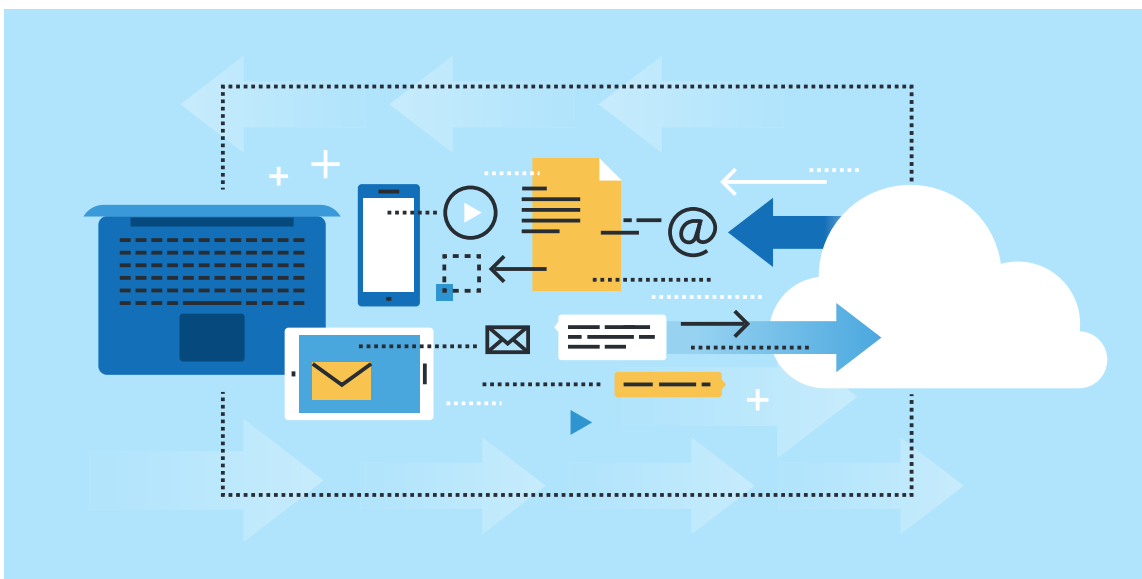
5. Cloud Operations



Ensure that you have 24x7 support, not only for your applications but also with resources that have the AWS skills required to troubleshoot infrastructure issues. Make sure as well that you're staying on top of system maintenance and upgrades after the move.

SLA requirements should also be considered here. Cloud SLAs contain details regarding governance, security, compliance, and performance and uptime.

For Amazon's part, they have different SLAs for each product. For example, [EC2's SLA](#) states that AWS will use commercially reasonable efforts to make Amazon EC2 and Amazon EBS each available with a Monthly Uptime Percentage of at least 99.95%. And don't forget your liability and AWS shared responsibility model, which was already discussed above.



AWS provides several monitoring and logging services. The native known ones are [CloudWatch](#) and [CloudTrail](#). However, you should also look at leveraging comprehensive open source tools such as the [ELK stack \(Elasticsearch, Logstash and Kibana\)](#) and [Graylog](#). You can also look at popular modern commercial third party solutions such as [DataDog](#) and [New Relic](#). And make use of [AWS Trusted Advisor](#), which continuously analyzes your cloud footprint and provides recommendations to further optimize your AWS deployments with regards to management aspects such as cost and security.

Finally, the cloud - and in particular Amazon - brings with it significant and frequent changes. Keeping up with this rapid pace of innovation and change is especially important and should be considered as an ongoing task. You can start by tuning in to [AWS' main blog](#).

The Amazon Cloud Migration Checklist

Moving to the cloud has its challenges, but with the right approach and a migration strategy built to avoid obstacles, moving to the cloud can decrease risks and put you in control. In the section below, we've provided a convenient checklist and summary of everything you'll need in order to effectively manage your migration to the Amazon Cloud.

Phase 1 - Discovery Checklist

- List your applications
- Define your users and usage
- Identify network interdependencies
- Consider security and compliance regulations
- Gather a clear definition of your systems' RTO and RPO

Phase 2 - Assessment Checklist

- Understand the methods for migrating apps to IaaS
- Build your team - considering internal resources and/or outsourcing
- Utilize Amazon resources for specific skillsets
- Map on-premise third party solutions, to determine how easily they will migrate

Phase 3 - Proof of Concept Checklist

- Test your workload
- Estimate cloud costs
- Determine the amount and size of your compute and storage requirements
- Understand security requirements, and the need for network and security controls
- Qualify network performance
- Qualify tools and solutions needed for the migration

Phase 4 - Migration Checklist

- Create a blueprint of your desired cloud environment
- Create a rollback plan
- Identify tools for automating migration and data syncing
- Understand the implications of the "production day" data move
- Start small and prove value, with a phased approach

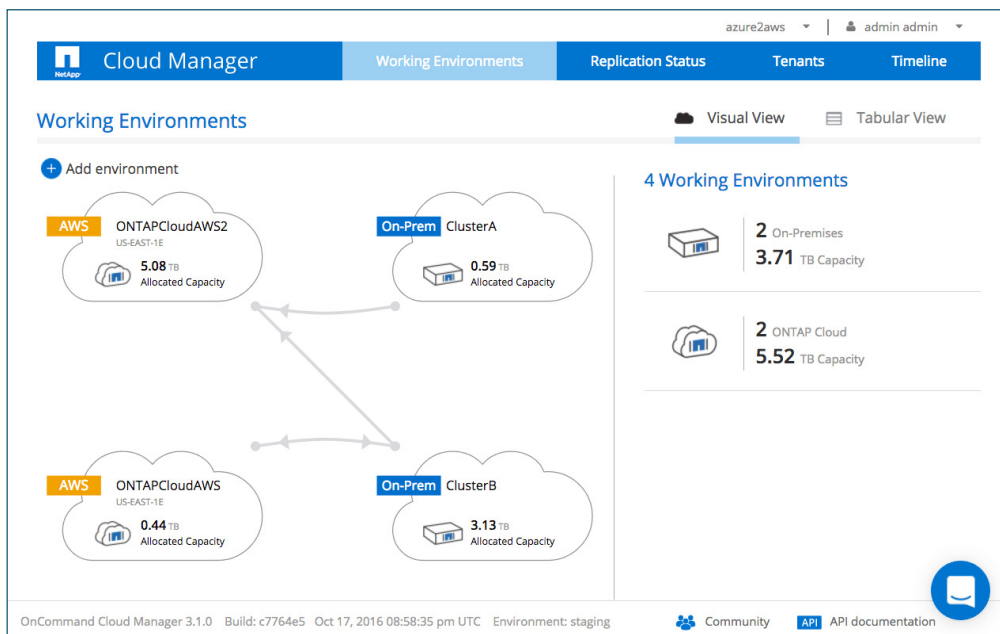
Phase 5 - Cloud Operations Checklist

- Keep up with the pace of innovation with 24x7 support via skilled AWS resources
- Stay on top of system maintenance and upgrades
- Consider SLA requirements - taking into account governance, security, compliance, and performance and uptime.

About NetApp® ONTAP Cloud for AWS

ONTAP Cloud, the leading enterprise storage operating system, is deployed using [OnCommand Cloud Manager](#) to deliver secure, proven NFS, CIFS, and iSCSI data management for AWS EBS storage. A software-only storage service running NetApp ONTAP software, ONTAP Cloud combines data control with enterprise-class storage features - such as data deduplication and compression - to minimize your EBS storage footprint.

You can take snapshots of your data without requiring additional storage or impacting your application's performance. And ONTAP Cloud can tie your Amazon cloud storage to your data center using the industry leading replication protocol, SnapMirror.



To enhance your data security, ONTAP Cloud offers NetApp-managed encryption of your at-rest storage, while you retain the encryption keys. [OnCommand Cloud Manager](#) handles deployment and management of ONTAP Cloud, giving you a simple point-and-click environment to manage your storage and ease control of your data.

ONTAP Cloud offers you the power of ONTAP software with flexible performance and EBS GP2, ST1 and SC1 capacity options: Explore (2TB), Standard (10TB) and Premium (368TB) - based on the EC2 instance type chosen. This is also available in a 6 or 12 month licensed model. For more information visit: cloud.netapp.com

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