Migrating to the AWS Cloud

in 5 Simple Steps

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Overview

Migrating enterprise applications and workloads to the cloud can seem like a daunting prospect. Cloud migration offers the promise of speed, scalability and cost-savings but when you're operating at enterprise scale, with significant dependencies and regulations to consider, how can you take steps to ensure that your cloud migration initiatives will deliver on those promises?

Once your organisation has made the decision to move your data, applications, and infrastructure from your on-premises hardware or data centre to Amazon Web Services (AWS), Enterprise Cloud Migration becomes more than simply moving your workloads to a pool of on-demand, shared resources that offer compute, storage, and network services at scale.

If your business is to fully realise the benefits of cloud computing quickly and effectively, it will take careful planning, a value-based approach to application migration and thoughtful consideration of the people and processes that you will need to help accelerate and strengthen the transition.

We've put together this 5-Step approach to Enterprise Cloud Migration to assist when planning your Cloud Migration strategy to AWS.

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Step 1

Strategic Vision & Planning

Before embarking upon a large-scale migration to AWS, your organisation needs to prepare itself for change. In his speech at AWS re:Invent 2018, AWS Enterprise Strategist, Jonathan Allen, highlighted two key needs before executing an enterprise migration:

1. The Ambitious Leader

Successful Cloud migrations are most commonly led by an ambitious individual who can communicate an unwavering vision for Cloud adoption to people at all levels of the organisation.

The strategic vision is likely to be underpinned by strong business drivers such as cost-reduction, increased business agility, improved security and availability, or preparedness for rapid growth.

2. The Enterprise Steering Group

A cross-functional team of senior leaders from across the business should form an Executive Steering Group that drives Cloud migration with respect to the strategic vision.

This group of individuals helps to translate the vision, understand dependencies, answer questions and remove impediments. Bringing together representatives from all departments (from Finance to HR) helps to bring everyone on board.

To effectively conduct the migration of enterprise workloads to the Cloud, you must first gain an understanding of each application, system, process or infrastructure component that you may wish to migrate; this usually takes place as a discovery phase using a readiness assessment comprising questionnaires, interviews and the AWS Application Discovery Service.

Once equipped with a deep enough understanding of the use cases, service level agreements, architectures, dependencies and complexities of each facet of your migration, you can begin to make decisions on which services to migrate first, and the most appropriate migration methodology to apply.

Once you have mapped out the network of applications and workflows that need to be migrated to AWS, you need to decide where to start. One common approach is to identify a 'Lighthouse Project' that can act as the beacon for other projects to follow.

Choose a well-understood project (a high-value and low-risk migration project) that is representative of many of your workloads, build a team of Cloud specialists around it and a Cloud 'Centre-of-excellence'.

VUse the project to explore and prove the processes and technologies needed to migrate successfully. A Lighthouse Project helps to lay a foundation for the rest of the migration initiative; project management patterns, technology tools, training needs, infrastructure foundations and application monitoring patterns can all be proposed at this early stage.

As your pilot project approaches completion, you are ready to accelerate your enterprise Cloud migration. Create an AWS Landing Zone to manage multiple AWS accounts for each migration initiative; Amazon's out-of-the-box Landing Zone capabilities will allow secure single-sign-on capabilities to each of your applications and apply best practices for Identify and Access Management (IAM) security and platform configuration as you start to rapidly bring on board new applications.

Step 2

Value-Based Migration Strategies

The discovery phase of an Enterprise Cloud Migration will highlight the fact that every application or workload is likely to have differing needs.

To choose the most appropriate means of migrating each workload to AWS you will need to assess the value that each initiative offers to the business and the risk involved in changing a workload's behaviour as you move it.

The following 7 "Rs" of Enterprise Cloud Migration summarise the different options available for migrating to AWS.

Migration Strategy	
Relocate	Move existing VMWare virtual machines into AWS
Re-Host	Lift and Shift existing servers to EC2
Re-Platform	Move applications to EC2, RDS or DynamoDB
Refactor	Re-architect to Cloud-native and serverless
Retain	Consider lower-cost, shared hosting options
Re-Purchase	Purchase SaaS or AWS Marketplace alternative
Retire	Decommission non-core services

Fig. 1 Enterprise Migration Strategies

1. Relocate

If you are using VMWare's VSphere products to host virtualised servers, these can be migrated directly to AWS (in limited regions) using vMotion or VMWare HCX. Relocation of existing VMs requires little change in configuration and few new technology skills.

It is ideal for where the primary business driver is to retire an existing data centre, or hardware.

2. Re-Host

The most common approach for rapid Cloud migration is to re-host workloads from existing servers on Amazon EC2 instances. The AWS Server Migration Service can be used to create Amazon Machine Images (AMIs) from existing hosts which can then be used to create AWS EC2 instances.

It is recommended that the same operating system is used inside AWS, where possible, to ensure a smooth transition.

3. Re-Platform

To optimise for cost and scalability in the Cloud, many organisations take the opportunity to move exiting applications onto Cloud-ready technologies as they move them into AWS, without fundamentally changing the underlying architecture of the system – an example might be taking the opportunity to move to a managed application service such as AWS Elastic Beanstalk, or simply altering the web application server you use to reduce hosting charges.

The cost-savings associated with moving your database to DynamoDB or RDS are attractive. Use the AWS Schema Conversion Tool to evaluate compatibility of your database with AWS offerings and then leverage the AWS Database Migration Service to move data into new data stores.

For large-scale operations that require the movement of significant data volumes into AWS you may need to consider integrating with Snowball Edge for encrypted data transfer.

4. Refactor

Refactoring or revising an application for cloud-native technologies can be tempting but should be carefully considered when migrating large numbers of applications as it can be a steep learning curve that adds complexity to rapid migration.

Ambitious engineers who want to fully embrace the automation and elasticity of the Cloud may wish to refactor their applications to use serverless technologies such as DynamoDB for columnar data, S3 for unstructured data, Lambda with API Gateway for web services and SQS for distributed messaging.

Refactoring, while risky during an Enterprise migration, allows for the adoption of DevOps practices using CloudFormation, AWS CodePipeline and AWS CodeDeploy; all important skills for AWS best-practice in the Cloud.

5. Retain

There will, inevitably, be applications that cannot be cost-effectively migrated to AWS, or for which the priority is low enough not to consider migrating them at this time (for instance a system you only recently upgraded, or a system you plan to retire in the future).

For these applications we find that organisations who are trying to retire their data centres choose instead to move these applications into co-located data centres or make use of AWS DirectConnect partners until they are ready to revisit the initiative.

This provides some cost-savings and helps to spread the responsibility for disaster recovery strategies.

6. Re-Purchase

Your discovery phase may identify in-house applications that don't contribute to the core business offerings where it may be beneficial to purchase an off-the-shelf offering instead.

This migration strategy allows you to free valuable development resources for innovation on your core business offerings by removing the burden of installation and maintenance for everyday needs.

Examples may include backup and DR, security (authentication), monitoring tools or reporting applications which are readily available on the Amazon Marketplace.

7. Retire

For applications that are no longer core to the main operation of the business, strongly consider decommissioning these systems to save hosting and maintenance costs.

Consolidation of disparate monitoring systems can, for example, allow you to retire multiple systems and hosts and reduce the burden of maintenance and security.

Amazon themselves find that Enterprise organisations migrating to the Cloud can commonly retire between 10-20% of their applications.

Monitoring Throughout the Migration & Beyond

As you migrate your applications and workloads to the Cloud, you'll want to maintain visibility of your resources to ensure that you understand the costs, health and performance of your systems.

With the ease of provisioning new resources in the Cloud you may find that, as your migration progresses, the number of Cloud provider accounts and resources grows rapidly. Maintaining overarching visibility of resource usage and system health is important to reduce the time it takes to troubleshoot and respond to system incidents.

Building in best practices for monitoring and maintainability from the outset can significantly reduce the effort required to identify problematic resources.

Build for Observability

- Make use of AWS Organisations for management of multiple accounts and consolidated billing
- Implement automated metrics capture using CloudWatch Agent on EC2 instances to capture curated logs and metrics that can be used in custom Dashboards
- Add custom CloudWatch metrics into applications as you re-platform and re-factor them to increase visibility into application health and system resource usage
- Consider integrating an Application Performance Management agent to monitor system usage in real-time and provide intelligent insight into bottlenecks.

Plan for Repeatable Backup and Recovery

Most AWS service offerings provide self-service backup options, but they are limited in functionality. AWS Backup has no built-in Disaster Recovery (DR) capabilities, it's not application-consistent and, although it manages snapshots by individual volumes, it does not do this at the level of a full instance with all its volume and associated meta data.

As you move your critical business workloads into the Cloud, you need to consider how you will backup your systems for compliance and DR needs, and how you would restore them in the event of failure. Third party software vendors provide DR and backup solutions that can complement your AWS environment with minimum additional overhead.

Before exploring your DR options, research and understand the Recovery Time Objective (RTO) and Recovery Point Objective (RPO) requirements for each application or service you migrate to the Cloud.

Your RTO will govern the availability and uptime of each system and should shape the architecture chosen in the Cloud – applications with a low RTO will need to ensure redundancy through multiple instances and use of multiple AWS regions to ensure high availability.

Applications with a low RPO require a robust data backup solution with a rapid means of data recovery.

Step 4

Skills and Training

Supplement Teams for Technology Acceleration and Lasting Change

To facilitate the transition of enterprise applications and infrastructure to the cloud, you are likely to want to supplement your existing teams by bringing in experienced cloud engineering resources to accelerate the technical transition and lay the foundation for cloud technology best practices.

Whether you choose to employ permanent hires, contract staff or engage the services of a third-party specialist consultancy to help migrate your workloads to AWS, consider the roles that you need those new faces to perform before, during and after the migration:

- Define and embed technical patterns and processes for cloud service usage
- Evangelise AWS and cloud technologies, encouraging continuous innovation
- Facilitate adaptive project methodologies to ambitious timescales throughout the migration and beyond
- Solve complex problems during migration of enterprise-scale workloads
- Inspire lasting change

Give Teams the Skills They Need to Succeed

For those employees who are responsible for building and maintaining applications, data or infrastructure, a migration to AWS will require them to learn new technology skills and apply new ways of working. Training your staff early during the migration process will help to ensure that people are well-equipped for change.

As you identify the service offerings, tools and processes that you want to adopt; consider conducting on-site training courses to familiarise everyone on your team with AWS technologies and cloud concepts; training a full team over 1-2 days can offer significant cost-savings over sending individuals on independent training courses distributed throughout the migration.

Technical training workshops in AWS services, common architectural patterns and the supporting cloud technology toolkits (for instance Infrastructure as Code, or Platform-as-a-service technologies) will help kick-start the migration of applications and infrastructure and will help engage employees as the demands on them change.

Underpin the success of your migration projects by ensuring that everyone involved in your enterprise migration has a clear understanding of the goals of the initiative.

For non-technical or managerial staff, a broad introductory training course can de-mystify the core concepts of cloud computing such as cost-savings, elasticity and time-to-value.

Demonstrating Value

The success of any Cloud migration activity will be measured based on how well the initiative is perceived to have met the original business goals, and how well it has delivered on the promise of the strong strategic vision.

Whether your primary driver is to retire a data centre, or to reduce time to market, you should be measuring the effectiveness of your migration towards those goals so that you may demonstrate value.

In order to demonstrate value of Cloud migration projects, seek to identify Key Performance Indicators that provide visibility of the value of changes being made to operational procedures and technologies. Define up to 50 KPIs that can be measured across projects, ensuring that each measure can demonstrate value towards the overarching strategy. Areas in which to define KPIs include (but are not limited to):

Build for Observability

- **Cost of on-premises hosting** - staffing, IT cost per transaction, hardware lifetime, total capital investment, energy costs
- **Migration costs** – training time, management, re-architecting time, recruitment
- **Cloud operational costs** – specialist staff, monthly expenditure, third party tooling costs
- **Profitability** – correlation between migration and sales growth, revenue, cost per transaction, cash flow change as you move from a capital expenditure model to an operational expenditure model
- **RTO and RPO** – backup and DR, data storage costs, security and compliance
- **Agility** – Project lead time, service availability, application performance, feature cycle time
- **Automation** – Security guardrails in place, resource health, failure recovery time
- **Customer Satisfaction** – SLA compliance, retention rates, support call rates, Net Promoter Score

Measure	Value
Total Cost of Ownership	Reduction in CapEx in favour of monitorable OpEx
Availability & Resilience	High availability and uptime to meet SLAs
Mean Time to Recovery	Lower MTTR increases customer satisfaction and helps to meet SLAs
Release Cadence	More frequent application release cycle for increased business agility
Customer NPS	Customer satisfaction levels increased due stability of service and speed of delivery

Fig. 2 Example Success Measures

A successful cloud migration requires careful preparation and planning. There is no off-the-shelf template approach for migrating enterprise workloads to the Cloud, so you'll need to build a deep understanding of your current infrastructure and applications in order to evaluate the value and risk of different migration methods.

Your teams will need to expand their knowledge of AWS technologies in order to equip them for the complexity and challenges that a migration may involve.

Bringing the people, processes and technologies together paves the way for demonstrable value and reduced cost of ownership of migrated applications and workloads.

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