

Well Architected Framework (AWS)

The AWS Well-Architected Framework is a set of best practices and guidelines for designing and operating reliable, secure, efficient, and cost-effective systems in the cloud. It offers a structured approach to evaluate and improve existing architectures and plan new ones.

Consistent use of the framework ensures that your operations and architectures are aligned with industry best practices, enabling you to identify areas for improvement. We believe that adopting a Well-Architected approach that incorporates operational considerations significantly improves the likelihood of business success.

Here are the six pillars on which the AWS Well-Architected Framework is based.

An easy way to remember these is through using the acronym PSCORS:

- P** - Performance Efficiency
- S** - Security
- C** - Cost Optimisation
- O** - Operational Excellence
- R** - Reliability
- S** - Sustainability



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Navigating Cloud Migration: Choosing the Right Strategy

Organisations are increasingly moving to the cloud due to a variety of factors, including the need for greater agility, scalability, cost-efficiency, and improved security. Cloud providers offer businesses access to a wide range of services and resources that can be quickly provisioned and scaled to meet changing business needs.

Cloud migration is the process of moving an organisation's data, applications, and other digital assets from on-premises infrastructure to a cloud computing environment. Migrating to the cloud offers many benefits, including greater flexibility, scalability, security, and cost savings. However, there are many different cloud migration strategies to choose from, each with its own unique set of benefits and challenges.

When we talk about migrating a workload to the Cloud, we're referring to the process of moving an application or workload to the cloud. In this article, we'll focus on the migration strategies for the AWS Cloud.

The 7 R's

It's really important to select the right migration strategies for a large migration. You might have already selected the strategies during the mobilise phase or during the initial portfolio assessment.

There are seven migration strategies that we call the 7 Rs, which are:

- Retire
- Retain
- Rehost
- Relocate
- Repurchase
- Replatform
- Refactor

Retire

Retire is the strategy we use for applications that we want to decommission or archive. This means that we can shut down the servers within that application stack. Here are some common use cases for the retire strategy:

- There's no business value in retaining the application or moving it to the cloud.
- We want to eliminate the cost of maintaining and hosting the application.
- We want to reduce the security risks of operating an application that uses an operating system (OS) version or components that are no longer supported.

Performance Efficiency Pillar

The performance efficiency pillar aims to optimise IT and computing resources allocation by providing a structured and streamlined approach. It involves selecting the appropriate resource types and sizes that meet workload requirements, monitoring performance, and maintaining efficiency as business needs evolve.

Design Principles

To achieve and maintain efficient workloads in the cloud, consider the following design principles:

- **Democratise advanced technologies:** Enable your team to focus on product development by delegating complex tasks to your cloud vendor.
- **Go global:** Deploying your workload in multiple regions around the world.
- **Use serverless architecture** Serverless architectures remove the need to run and maintain physical servers for traditional compute activities.
- **Experiment more often:** With virtual and automated resources, you can quickly carry out comparative testing using different types of instances, storage, or configurations.
- **Consider mechanical sympathy:** Mechanical sympathy is when you use a tool or system with an understanding of how it operates best. When you understand how a system is designed to be used, you can align with the design to gain optimal performance.

"You don't have to be an engineer to be a racing driver, but you do have to have Mechanical Sympathy."

Jackie Stewart, racing driver



Cloud Migration

The 7Rs of cloud migration encompass a range of strategies for transitioning applications to the cloud. These options provide a structured framework for choosing the most suitable migration approach based on factors like cost, effort, and business goals.

- We might want to retire applications based on their performance, such as those that have an average CPU and memory usage below 5 percent, which we call zombie applications. We might also retire some applications that have an average CPU and memory usage between 5 and 20 percent over a period of 90 days, known as idle applications. To identify zombie and idle applications, we can use the utilisation and performance data from our discovery tool.
- Finally, if there has been no inbound connection to the application for the last 90 days, we might consider retiring it.

Considerations

- **Usage and Value:** Assess the application's current usage and value to the organisation. Is it still providing significant benefits, or has its relevance diminished?
- **Business Impact:** Determine how retiring the app might affect various business processes, user groups, and overall operations.
- **Dependencies:** Identify any dependencies the app might have on other systems or processes, and how retiring it could impact these dependencies.
- **Data and Migration:** Plan for the migration or archiving of data associated with the app. Ensure data integrity and compliance with regulations.
- **User Communication:** Plan how to communicate the retirement to users, stakeholders, and any affected parties. Provide a clear timeline and transition plan.
- **Legal and Compliance:** Consider legal and compliance implications, especially if the app handles sensitive or regulated data.

Retain

If you've got apps that you're not quite ready to migrate or that you want to keep in your source environment, the Retain strategy is your go-to. You might decide to migrate these apps at a later time, but for now, you want to keep them right where they are. Here are some common scenarios where the Retain strategy is a good choice:

- **Security and compliance:** If you need to comply with data residency requirements, you might want to keep certain apps in your source environment.
- **High risk:** If an app is particularly complex or has a lot of dependencies, you might want to keep it in your source environment until you can make a detailed migration plan.
- **Dependencies:** If an app depends on other apps that need to be migrated first, you might want to retain it until those other apps are in the cloud.

Security Pillar

The security pillar focuses on safeguarding systems and data. It includes topics like data confidentiality, integrity, availability, permission management, and establishing controls to detect security events.

The security pillar offers guidance for architecting secure workloads on AWS by utilizing cloud technologies to improve the security posture.

Design Principles

To strengthen the security of workloads, consider the following design principles:

- **Implement a strong identity foundation:** Implement the principle of least privilege (POLP).
- **Maintain traceability:** Monitor, alert, and audit actions and changes to the environment in real-time.
- **Apply security at all layers:** Apply defence in depth approach with multiple security controls at all layers.
- **Automate security best practices:** Automate software-based security mechanisms.
- **Protect data in transit and at rest:** Classify data into sensitivity levels and use mechanisms such as encryption, tokenization, and access control.
- **Prepare for security events:** Ensure incident management, investigation policies and processes are in place.



- **Recently upgraded:** If you just invested in upgrading your current system, you might want to wait until the next technical refresh to migrate the app.
- **No business value to migrate:** For apps with only a few internal users, it might not make sense to migrate them to the cloud.
- **Plans to migrate to software as a service (SaaS):** If you're planning to move to a vendor-based SaaS solution, you might want to keep an app in your source environment until the SaaS version is available.
- **Unresolved physical dependencies:** If an app is dependent on specialised hardware that doesn't have a cloud equivalent, such as machines in a manufacturing plant, you might want to retain it.
- **Mainframe or mid-range apps and non-x86 Unix apps:** These apps require careful assessment and planning before migrating to the cloud. Examples include IBM AS/400 and Oracle Solaris.
- **Performance:** If you want to keep zombie or idle apps in your source environment based on their performance, the Retain strategy is a good choice.

Considerations

- **Business Relevance:** Assess the application's ongoing relevance to business goals.
- **Dependencies:** Evaluate dependencies with other systems or processes.
- **Maintenance:** Consider ongoing maintenance efforts and costs.
- **Security:** Ensure the application remains secure and compliant.
- **Data Management:** Plan for data storage, integrity, and compliance.
- **Integration:** Check if the app can integrate with newer technologies.
- **Legacy Support:** Plan for older technology and skill maintenance.
- **Documentation:** Keep documentation up-to-date for the application.
- **Lifecycle Planning:** Consider the long-term lifecycle of the application.
- **Resource Allocation:** Allocate resources for maintenance and updates.
- **Risk Management:** Address potential risks related to security, compatibility, etc.
- **User Communication:** Communicate app's continued use and support.
- **Training:** Provide ongoing training for users and support staff.
- **Cost-Benefit Analysis:** Continuously assess costs vs. benefits of retention.
- **Exit Strategy:** Plan for eventual phasing out or replacement.
- **Monitoring and Review:** Regularly review app's performance and relevance.

Cost Optimisation Pillar

The cost optimisation pillar focuses on controlling fund allocation, selecting the right type and quantity of resources, and scaling efficiently to meet business needs without incurring unnecessary costs. To achieve financial success in the cloud, it is crucial to understand spending over time and invest in cloud financial management.

Design Principles

To achieve cost optimisation, consider the following design principles:

- **Implement cloud financial management:** Build capability through knowledge building, programs, resources, and processes to become a cost-efficient organisation.
- **Adopt a consumption model:** Pay only for the computing resources you consume and increase or decrease usage based on business requirements.
- **Measure overall efficiency:** Measure business output and costs associated with delivery to understand the gains you make from increasing output, functionality, and reducing cost.
- **Stop spending on undifferentiated heavy lifting:** Let the cloud provider take the operational burden of managing infrastructure.
- **Analyse and attribute expenditure:** Use cloud tools to accurately identify the cost and usage of workloads.



Rehost or “Lift and Shift”

Rehosting your applications into the Cloud using this strategy is also called “lift and shift”. It means moving your application stack from your source environment to the Cloud without making any changes to the application itself. This means that you can quickly migrate your applications from on-premises or other cloud platforms to the Cloud, without worrying about compatibility or performance disruptions.

With rehosting, you can migrate a large number of machines, including physical, virtual, or other cloud platforms, to the Cloud without downtime or long cutover windows. This helps minimise disruption to your business and your customers. The length of downtime depends on your cutover strategy.

The rehosting strategy lets you scale your applications without making any cloud optimisations, which means you don't have to spend time or money-making changes to your applications before migration. Once your applications are running in the cloud, you can optimise or re-architect them more easily and integrate them with other cloud services. With regards to AWS Cloud, you can make the migration process even smoother by automating the rehosting process using services such as:

- AWS Application Migration Service
- AWS Cloud Migration Factory Solution

Considerations

- **Compatibility:** Check application's compatibility with minimal changes.
- **Infrastructure:** Ensure new environment aligns with app's needs.
- **Resource Sizing:** Determine required resources for optimal performance.
- **Data Migration:** Plan for secure data transfer and integrity.
- **Networking and Security:** Address network and security configurations.
- **Licensing:** Ensure compliance with software licenses.
- **Testing:** Rigorous testing for proper functionality.
- **Performance:** Optimise app's performance during migration.
- **Backup/Rollback:** Plan for backup and possible rollback.
- **Downtime:** Communicate and plan for potential downtime.
- **User Communication:** Inform users about migration and disruptions.
- **Training:** Train IT staff and users for new environment.
- **Monitoring/Support:** Establish monitoring and support systems.

Operational Excellence Pillar

The operational excellence pillar within the AWS Well-Architected Framework is focused on running and monitoring systems, and continuously improving processes and procedures. This includes automating changes, responding to events, and defining standards to manage daily operations.

Design Principles

For operational excellence in the cloud, consider the following design principles:

- **Perform operations as code:** Applying engineering discipline that is used for application code to the entire environment in the cloud.
- **Make frequent, small, reversible changes:** Design workloads to allow components to be updated regularly, which increases the flow of beneficial changes into the workload.
- **Refine operational procedures frequently:** As operational procedures are used, teams should look for opportunities to improve them. As the workload evolves, procedures should be evolved appropriately.
- **Anticipate failure:** Performing "pre-mortem" exercises to identify potential sources of failure so they can be removed or mitigated. Testing failure scenarios and validating understanding of their impact.
- **Learn from all operational failures:** Drive improvement through lessons learned from all operational events and failures. Share what is learned across teams and through the entire organisation.



- **Contingency:** Prepare for unexpected issues.
- **Documentation:** Update documentation for new environment.
- **Post-Migration Review:** Evaluate migration's success.

Relocate

If you are looking to transfer a large number of servers or instances from your on-premises platform to a cloud version of the platform, then the relocate strategy could be the right choice for you. With this strategy, you can move one or more applications to a different virtual private cloud (VPC), AWS region or AWS account. For instance, you can transfer servers in bulk from VMware software-defined data centre (SSDC) to VMware Cloud on AWS or move an Amazon Relational Database Service (Amazon RDS) DB instance to another VPC or AWS account.

The relocate strategy is great because you don't have to buy new hardware, rewrite applications, or modify your existing operation. During relocation, your application will keep serving users, which means you'll experience minimal disruption and downtime. In fact, it's the quickest way to migrate and operate your workload in the cloud because it won't affect the overall architecture of your application.

Repurchase

Repurchasing your application is a migration strategy that involves replacing your existing on-premises application with a different version or product. This new application should offer more business value than the existing one, such as accessibility from anywhere, no infrastructure maintenance, and pay-as-you-go pricing models. This strategy can help reduce costs associated with maintenance, infrastructure, and licensing. Here are some common use cases for the repurchase migration strategy:

- Moving from traditional licenses to Software-as-a-Service (SaaS) to remove the burden of managing and maintaining infrastructure and reduce licensing issues.
- Upgrading to the latest version or third-party equivalent of your existing on-premises application to leverage new features, integrate with cloud services, and scale the application more easily.
- Replacing a custom application by repurchasing a vendor-based SaaS or cloud-based application to avoid recoding and re-architecting the custom application.

Reliability Pillar

The reliability pillar of AWS focuses on ensuring that workloads perform their intended functions and can recover quickly from failures. This section covers topics such as distributed system design, recovery planning, and adapting to changing requirements to help you achieve reliability.

Design Principles

To help increase the reliability of your workloads in the cloud, consider the following design principles:

- **Automatically recover from failure:** Monitor key performance indicators (KPIs) to run automation when a threshold is breached. Use KPIs that measure business value and not just the technical aspects of the service's operation.
- **Test recovery procedures:** In the cloud, you can test how your workload fails and validate your recovery procedures. You can use automation to simulate different failures or recreate scenarios that led to failures before.
- **Scale horizontally to increase aggregate workload availability:** Replace one large resource with multiple small resources to reduce the impact of a single failure on the overall workload.
- **Stop guessing capacity:** In the cloud, you can monitor demand and workload utilisation and automate the addition or removal of resources to maintain the optimal level to satisfy demand without over- or under-provisioning.
- **Manage change through automation:** Changes to your infrastructure should be made using automation. Manage changes to the automation, which can be tracked and reviewed.



Before purchasing the new application, you should assess it based on your business requirements, particularly security and compliance.

After purchasing the new application, here are the next steps:

- Training your team and users on the new system.
- Migrating your data to the newly purchased application.
- Integrating the application into your authentication services, such as Microsoft Active Directory, to centralise authentication.
- Configuring networking to help secure communication between the purchased application, your users, and your infrastructure.

Typically, the application vendor assists with these activities for a smooth transition.

Considerations

- **Vendor Evaluation:** Assess potential vendors and their offerings.
- **Features and Functionality:** Ensure the selected software meets business needs.
- **Integration:** Consider how the new software integrates with existing systems.
- **Data Migration:** Plan for smooth and accurate data migration.
- **Customisation:** Evaluate the ability to customise software.
- **Training:** Provide training for users and IT staff on the new software.
- **Data Security:** Ensure the security and compliance of the software.
- **Vendor Lock-In:** Consider the potential for vendor-specific dependencies.
- **Total Cost of Ownership:** Assess the long-term costs.
- **User Experience:** Evaluate the user experience and usability.
- **Support and Maintenance:** Understand the vendor's support and update policies.
- **Implementation Timeline:** Project planning of the transition with minimal disruptions.
- **User Communication:** Inform users about the change and its benefits.
- **Testing:** Test the new software before full deployment.
- **Backup and Rollback Plan:** Prepare for potential issues and establish backup plans.
- **Documentation:** Update documentation.
- **Post-Implementation Review:** Evaluate success.

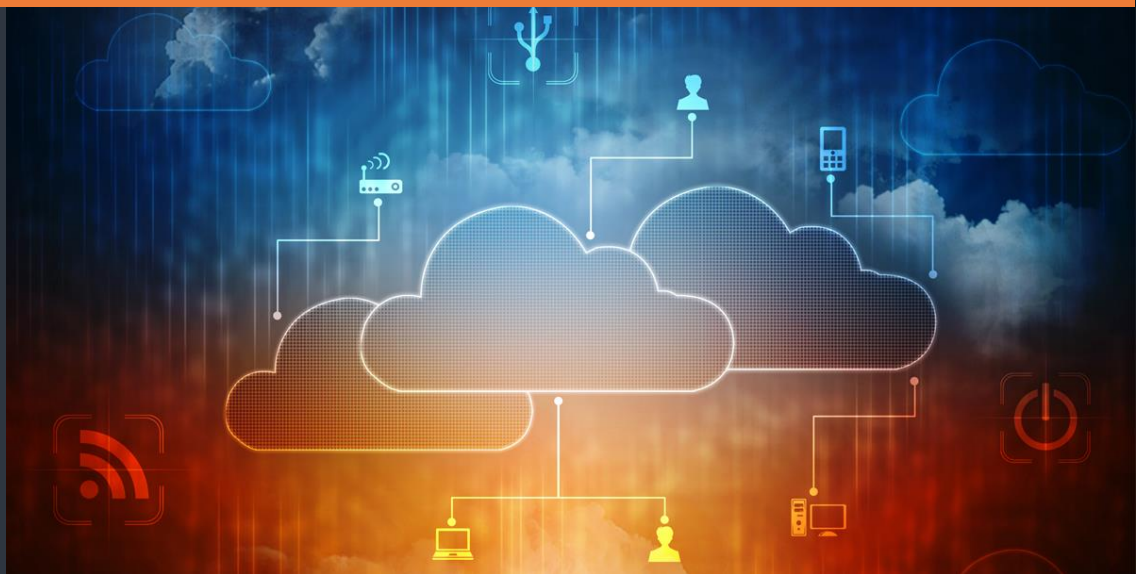
Sustainability Pillar

The sustainability pillar aims to decrease the environmental impact of cloud workloads through a shared responsibility model, impact evaluation, and maximising utilisation to minimise required resources and reduce downstream impacts.

Design Principles

To enhance sustainability and minimise impact when creating cloud workloads, consider the following design principles:

- **Understand the impact:** Measure the impact of cloud workloads and forecast future impact by including all sources of impact.
- **Establish sustainability goals:** Set long-term sustainability goals for each cloud workload and model the return on investment of sustainability improvements.
- **Maximise utilisation:** Optimise workloads to ensure high utilisation and maximise energy efficiency by eliminating idle resources, processing, and storage.
- **Anticipate and adopt new hardware and software:** Monitor and evaluate new, more efficient hardware and software offerings and design for flexibility.
- **Use managed services:** Adopt shared services to reduce the infrastructure needed to support cloud workloads.
- **Reduce downstream impact:** Decrease the energy or resources required to use cloud services and eliminate the need for customers to upgrade their devices by testing with device farms.



Replatform

Replatforming, also known as lift, tinker, and shift or lift and reshape, is a migration strategy where you move your application to the cloud and introduce some level of optimisation to operate it more efficiently, reduce costs, or take advantage of cloud capabilities. For instance, you can move a Microsoft SQL Server database to Amazon RDS for SQL Server.

With the replatform strategy, you can make minimal or extensive changes to your application, depending on your business goals and your target platform. Here are some common use cases for replatforming:

If you want to save time and reduce costs, you can move to a fully managed or serverless service in the AWS Cloud. To improve your security and compliance posture, you can upgrade your operating system to the latest version using the End-of-Support Migration Program (EMP) for Windows Server. This program lets you migrate your legacy Windows Server applications to the latest supported versions of Windows Server on AWS, without any code changes. You can also reduce costs by using AWS Graviton Processors, custom-built processors developed by AWS.

If you want to cut costs by moving from a Microsoft Windows operating system to a Linux operating system, you can port your .NET Framework applications to .NET Core, which can run on a Linux operating system. You can use the Porting Assistant for .NET analysis tool to help you with this. You can also improve performance by migrating virtual machines to containers, without making any code changes. By using the AWS App2Container migration tool, you can modernise your .NET and Java applications into containerised applications.

The replatform strategy allows you to keep your legacy application running without compromising security and compliance. It reduces costs and improves performance by migrating to a managed or serverless service, moving virtual machines to containers, and avoiding licensing expenses.

The Business Case

A robust business case is vital to secure the necessary resources for establishing the core team, engaging partners if required, and completing the essential stages of application assessment, portfolio analysis, and migration planning. Business cases that support portfolio migrations are typically formulated in one of the following ways:

- **Total Cost of Ownership (TCO) Comparison:** This approach involves contrasting the current infrastructure landscape with the post-migration cloud service architecture. The comparison highlights the anticipated variations in operational costs for specific workload volumes.
- **Financial Analysis:** This type of business case presents metrics like Net Present Value (NPV), Return on Investment (ROI), Payback Period, Modified Internal Rate of Return (MIRR), and 3-5 year cash-flow analyses. It compares migrating to cloud, including migration costs, against staying with the current setup.

The scope of a business case is generally limited to either:

- Comparing infrastructure technology costs.
- Comparing infrastructure technology and operations costs.

In general, the larger the portfolio, the less developed the case needs to be. This is because broader assumptions can be made without significantly affecting the result. For a smaller portfolio, any change will have a greater impact, so more detail is required.



Considerations

- **Compatibility:** Assess application's compatibility with cloud environment.
- **Core Architecture:** Evaluate if core architecture needs adjustments.
- **Cloud Features:** Identify and leverage cloud-native features.
- **Cost Savings:** Consider potential cost savings compared to full rewrite.
- **Time-to-Market:** Faster deployment due to reduced changes.
- **Performance Optimisation:** Optimise app's performance in the cloud.
- **Data Migration:** Plan secure and accurate data migration.
- **Integration:** Ensure smooth integration with other cloud services.
- **User Communication:** Inform users about changes and benefits.
- **Training:** Train teams for new cloud tools and practices.
- **Testing:** Rigorous testing to ensure seamless functionality.
- **Scalability:** Leverage cloud's scalability for varying workloads.
- **Backup/Rollback:** Plan for data backup and rollback.
- **Monitoring and Support:** Set up monitoring and support systems.
- **Exit Strategy:** Plan for potential future migrations or updates.
- **Documentation:** Update documentation.
- **Post-Migration Review:** Evaluate success.

Refactor or Re-Architect

Refactoring or re-architecting is a cloud migration strategy that involves moving an application to the cloud and making changes to its architecture to take full advantage of cloud-native features. This is done to improve agility, performance, and scalability, and is often driven by business demands to scale, release products and features faster, and reduce costs.

Here are some common use cases for the refactor migration strategy:

- Your legacy mainframe application can no longer meet the demands of the business due to its limitations or is too expensive to maintain.
- You have a monolithic application that is slowing down product delivery and cannot keep up with customer needs and demands.

TCO Analysis

The process of optimising infrastructure costs involves comparing the Total Cost of Ownership (TCO) of existing infrastructure with a simplified cloud provider service cost model. This evaluation focuses on specific strategies that are easy to assess and can potentially lead to around 30 percent TCO savings, providing a compelling reason to proceed:

- **Compute Elasticity Enhancement:** Identify underutilised servers and transition them to on-demand services, billed only when in use.
- **Strategic Procurement with Savings Plans:** Strategically procure production and high-usage servers using savings plans,
- **Eliminate Redundant Servers:** Identify and exclude servers with CPU utilisation below 2% from the cost analysis.
- **Compute Optimisation:** Analyse historical CPU and memory utilisation data to select the appropriate instances, ensuring optimal compute power and memory allocation.
- **Rationalise RDBMS Licenses:** Reevaluate licensing needs for database servers after compute optimisation.
- **Streamline Storage:** Right-size total storage volume and assess IOPS requirements, considering movement to object storage with varying SLAs and costs.

By following these steps, businesses can make informed decisions about cloud migration, leading to substantial infrastructure cost reductions and enhanced operational efficiency.



- You have a legacy application that nobody knows how to maintain, or the source code is not available.
- The application is difficult to test, or test coverage is low, which affects the quality and delivery of new features and fixes. Redesigning the application for the cloud can help increase test coverage and integrate automated testing tools.
- For security and compliance reasons, you might need to move a database to the cloud but need to extract some tables (such as customer information, patient, or patient diagnosis tables) and keep those tables on premises. In this scenario, you will need to refactor your database to separate the tables that will be migrated from those that will be kept on premises.

By refactoring your application, you can take advantage of cloud-native features to improve performance, scalability, and agility. This strategy is particularly useful when your legacy application can no longer meet your business needs or is too costly to maintain.

Considerations

- **Code Analysis:** Evaluate existing codebase for inefficiencies.
- **Functional Enhancements:** Identify opportunities to enhance app's functionality.
- **Cloud-Native Components:** Leverage cloud-specific services and features.
- **Architecture Adjustments:** Restructure app's architecture for better cloud alignment.
- **Scalability:** Design for scalability and flexibility.
- **Performance Optimisation:** Optimise app's performance for cloud environment.
- **Data Migration:** Plan secure and accurate data migration.
- **Dependency Management:** Address dependencies for compatibility in the cloud.
- **Integration with Cloud Services:** Integrate with other cloud services as needed.
- **Cost-Benefit Analysis:** Assess cost vs. benefits of refactoring effort.
- **Testing:** Rigorous testing to ensure proper functionality.
- **User Communication:** Inform users about changes and benefits.
- **Training:** Train teams for new cloud tools and practices.
- **Backup/Rollback:** Plan for data backup and potential rollback.
- **Monitoring and Support:** Set up monitoring and support systems.
- **Documentation:** Update documentation
- **Post-Migration Review:** Evaluate success.

Application Portfolio Assessment

At a high-level, application portfolio assessment is the process of gathering application, infrastructure, and business context data to discover, analyse, and plan for moving the portfolio to the cloud. Assessment activities are critical for any business embarking on long-running cloud programs because the nature of that journey involves risk and cost.

In this strategy, the portfolio journey is represented as four main stages aligned to data requirements for the portfolio job at hand:

Discovery & Initial Planning:

- Update current understanding of the portfolio.
- Create directional business case.
- Establish base rationalisation migration models.
- Identify initial candidates.

Prioritised Apps Assessment:

- Assess, design, and plan prioritised applications.
- Enable short-term migrations.
- Build cloud foundations.

Portfolio Analysis & Planning:

- Develop complete portfolio view.
- Enhance dataset iteratively.
- Evolve business case.
- Create high-confidence migration wave plans.

Continuous Assessment & Enhancement:

- Enable large-scale migrations at scale.
- Assess apps & tech per wave.
- Iterate migration wave plan.
- Assess migrated workloads for optimisation and modernisation.



Determining Appropriate Migration Strategies

The process of identifying the most suitable migration approach involves the evaluation of various factors that impact migration speed, expenditure, and overall benefits. It is imperative to formulate strategies that harmonise several considerations, including business imperatives, architecture principles, prioritisation criteria, and business strategy. On occasions, these considerations may diverge in perspective. For example, the primary driver for migration might be innovation and agility. In addition, there may also be a need to reduce costs quickly. Whilst modernising and upgrading all applications could yield long-term cost savings, it demands a substantial initial investment.

In such scenarios, a viable option is to initiate the migration process using approaches that require less effort, such as rehosting or replatforming. This can quickly yield operational efficiencies and immediate cost savings. Subsequently, cost savings can be reinvested in modernisation of applications at a later time which will lead to further cost efficiencies. Nevertheless, an exclusive focus on complete rehosting of all applications would defer the broader benefits of modernisation. The key is to find a balance between migration strategies, where mission-critical applications are prioritised modernisation, whereas other applications can be rehosted or replatformed, followed by subsequent modernisation. This approach optimally balances immediate gains with long-term transformative aspirations.

Summary

Cloud migration is a complex process that requires careful planning and consideration of various factors. As discussed in this article, there are several strategies that organisations can use to migrate their applications to the cloud, including rehost, refactor, repurchase, and retire. Each strategy has its own benefits and drawbacks, and the choice of strategy will depend on the specific needs of the organisation.

While the benefits of cloud migration are many, including improved scalability, agility, and cost savings, it's important to approach the process with caution and to take a strategic approach. A successful cloud migration requires a clear understanding of the business goals and requirements, as well as careful consideration of security, compliance, and data protection.

Organisations that are considering a cloud migration should seek guidance from experienced cloud migration specialists and take advantage of the many tools and resources that are available to help simplify the process. With careful planning and the right strategy, cloud migration can be a powerful tool for driving innovation, improving efficiency, and delivering real value to the organisation and its customers.

Portfolio Discovery & Initial Planning

This stage of assessment focuses on completing the portfolio-level discovery and analysis started in the Portfolio discovery and initial planning section.

The goal is to iterate and establish a baseline for the initial portfolio of applications and infrastructure.

This baseline includes identifying all dependencies, iterating rationalisation models for migration, creating a detailed business case, and outlining a migration wave plan.

As a result, the required data fidelity is higher. This stage will require time investment. To accelerate assessment outcomes, we recommend using as many programmatic data sources, such as discovery tooling, as possible.

- Primary outcomes of this stage include the following:
- A high-fidelity application and infrastructure inventory.
- A high-level migration strategy for each application
- A high-confidence migration wave plan.
- A detailed business case.



Strategy, Scope & Timeline

The success of any migration program relies on three key elements: strategy, scope and timeline. These elements need to be aligned from the beginning of your migration program to set the stage for a successful journey.

Cloud Migration: Strategy and Best Practices - Part 1

Migrating to the cloud can offer numerous benefits, including improved scalability, flexibility, and cost savings. However, the migration process can be complex and challenging, especially for organisations that are new to cloud computing. To ensure a successful migration, it's crucial to follow best practices and avoid common pitfalls.

Now, migrating at scale isn't just about the number of servers you're moving over. It also involves a whole host of complexities like people, processes, and technology. This is part one of a three-part series of articles that dive deeper into cloud migration strategy and best practice diving deeper into people, process and technology. In this article, we'll focus on the 'people' perspective of large cloud migration projects. By following these best practices, you can streamline the migration process, reduce risk, and maximise the benefits of cloud computing.

Strategy, Scope and Timeline

The success of any migration program relies on three key elements: strategy, scope and timeline. These elements need to be aligned and understood from the very beginning of your migration program to set the stage for a successful journey. Any changes to one element will affect the others, so realignment should be factored in for every change, no matter how basic or sensible the change might seem.

Strategy: Why do You Want to Migrate?

There are various reasons why you might be planning to migrate to AWS. Regardless of your reasons, it's essential to understand what your drivers are, communicate them, and prioritise them. Each additional driver adds time, costs, scope, and risks to your migration program. Once you define your migration strategy, alignment of requirements across various stakeholders and teams is crucial for success.

Different teams like Infrastructure, Security, Application, and Operations need to work towards a single goal and align their priorities with a single timeline of migrations. We recommend exploring how the desired business outcomes can be aligned across the various teams to minimise friction and ensure a smooth migration.

Prioritised Applications Assessment

One of the key outcomes of the previous stage, portfolio discovery and initial planning, was to prioritise a subset of applications for detailed assessment. This section explores the detailed assessment of applications.

Looking at the details of a few applications early on will drive acceleration. The process of assessment and to-be architecture design surfaces potential blockers and clarifies important tasks that precursors to the larger-scope migration.

These tasks include gathering requirements to establish AWS foundations, such as the landing zone on AWS, or to extend and validate the existing landing zone. This assessment is also the time to consider the steps and the strategy for migration. The primary outcomes of this stage are the following:

- Validated list of prioritised applications
- Documented current state architecture
- Documented initial target architecture and migration strategy for migration candidates
- Identified migration patterns and tooling
- Documented platform requirements (security, AWS infrastructure, and operations)
- Documented cutover considerations for migration planning
- Estimated AWS run rate



Scope: What Are You Migrating?

It's not uncommon for the total scope of a migration program to be undefined, even when you're already halfway through the migration. Unknowns like shadow IT or production incidents can pop up unexpectedly, causing delays and shifts in your plans. To avoid this, it's recommended to invest time in defining the scope, working backwards from your target business outcome. Using discovery tooling to uncover assets is a best practice that can help you define the scope. Be flexible and have contingency plans in place to keep the program moving forward, as the scope will inevitably change with large migrations.

Timeline: When do You Need to Complete the Migration?

Your migration program's timeline should be based on your business case and what's possible to achieve in the allocated time. If your driver for migrating is based on a fixed date of completion, you must choose the strategy that meets that timeline requirement. For these time-sensitive types of migrations, it's recommended to follow the "Migrate first, then modernise" approach. This helps set expectations and encourages teams to align their individual project plans and budgets with the overall migration goal. It's important to address any disagreements as early as possible in the project, fail fast, and engage the right stakeholders to ensure that alignment is in place.

On the other hand, if your main goal of migration is to gain the benefits of application modernization, this must be called out early in the program. Many programs start with an initial goal based on a fixed deadline, and they don't plan for the requirements from stakeholders who want to resolve outstanding issues and problems. It's important to note that modernisation activities during a migration can affect the functionality of business applications. Even a seemingly small upgrade like an operating system version change can have a significant impact on the program timelines. Therefore, it's crucial not to consider these upgrades trivial and to plan accordingly.

Best Practices for Large Migrations

Migrating to the cloud can be a daunting task, especially for large organisations. The success of a large migration project depends on several factors that need to be addressed from the very beginning of the project. In this section, we will discuss some best practices for large migrations that are based on data from other customers.

Portfolio Analysis & Migration Planning

This stage of assessment focuses on completing the portfolio-level discovery and analysis started in the Portfolio discovery and initial planning section.

The goal is to iterate and establish a baseline for the initial portfolio of applications and infrastructure.

This baseline includes identifying all dependencies, iterating rationalisation models for migration, creating a detailed business case, and outlining a migration wave plan.

As a result, the required data fidelity is higher. This stage will require time investment. To accelerate assessment outcomes, we recommend using as many programmatic data sources, such as discovery tooling, as possible.

- Primary outcomes of this stage include the following:
- A high-fidelity application and infrastructure inventory.
- A high-level migration strategy for each application
- A high-confidence migration wave plan.
- A detailed business case.



In this section, we will discuss some best practices for large migrations that are based on data from other customers. These practices are divided into three categories:

- **People**
- **Technology**
- **Processes**

People Perspective

This section focuses on the following key areas of the people perspective:

- **Executive support:** Identifying a single-threaded leader who's empowered to make decisions
- **Team collaboration and ownership:** Collaborating among various teams
- **Training:** Proactively training teams on the various tooling

Executive Support

Identify a Single-Threaded Leader

When it comes to large migrations, it's crucial to have the right people in place who can make informed decisions and ensure that the project stays on track. This involves identifying a single-threaded leader who is accountable for the project's success and empowered to make decisions. The leader should also help avoid silos and streamline work-streams by maintaining consistent priorities.

For instance, a global customer was able to scale from one server per week at the outset of the program to over 80 servers per week at the start of the second month. This was only possible due to the CIO's full support as a single-threaded leader. The CIO attended weekly migration cutover calls with the migration team to ensure real-time escalation and resolution of issues, which accelerated the migration velocity.

Cloud Adoption Framework (CAF)

Cloud adoption frameworks, like the AWS Cloud Adoption Framework (AWS CAF), provide guidance based on best practices and industry experience to help organisations navigate their digital transformation journeys and achieve desired business outcomes using cloud technologies.

The AWS Cloud Adoption Framework offers a structured approach to identify and prioritise transformation opportunities, assess cloud readiness, and develop a transformation roadmap that can be iteratively refined over time.

Foundational Capabilities

In simple terms, a capability refers to an organisational ability to utilise processes and resources, including people, technology, and other assets, to accomplish specific goals.

In the context of the AWS Cloud Adoption Framework, these foundational capabilities offer best practice guidance to enhance your cloud readiness, ensuring effective utilisation of the cloud for digital transformation. AWS CAF organises these capabilities into six perspectives:

- **Business**
- **People**
- **Governance**
- **Platform**
- **Security**
- **Operations**

Each perspective encompasses a collection of capabilities that are owned or managed by stakeholders associated with your cloud transformation journey.



Align the Senior Leadership Team

Achieving alignment between teams regarding the success criteria of the migration is crucial. Although a small, dedicated team can handle migration planning and implementation, defining the migration strategy, and carrying out peripheral activities can pose challenges that may require involvement from different areas of the IT organisation.

These areas include business, applications, networking, security, infrastructure, and third-party vendors. In such cases, it is essential to have direct involvement from application owners and leadership, establish alignment, and establish a clear escalation path to the single-threaded leader.

Team Collaboration and Ownership

Create a Cross-Functional Cloud-Enablement Team

To successfully migrate to the cloud, it's crucial to have a team that is focused on enabling the organisation to work efficiently in the cloud. We recommend creating a Cloud Enablement Engine (CEE), which is a cross-functional team responsible for ensuring the organisation's readiness for migrating to AWS. The CEE should include representation from various departments, including infrastructure, applications, operations, and security, and be accountable for developing policies, defining and implementing tools and processes, and establishing the organisation's cloud operations model.

As the cutover data approaches, it is a good idea to setup a war room, where stakeholders from different areas, such as infrastructure, security, applications, and business, can work together to resolve issues. This will enable the team to meet deadlines and successfully complete the migration.

Define Requirements for All Stakeholders

It's important to plan in advance for the involvement of teams and individuals who are not part of the core migration team. This involves identifying these groups and defining their role during the migration planning stages. Specifically, it's important to involve the application teams as they possess crucial knowledge of the applications, and their participation is needed to diagnose issues and sign off on the cutover.

CAF - Business Perspective

The business perspective within the AWS Cloud Adoption Framework focuses on leveraging your cloud investments to accelerate your digital transformation ambitions and drive tangible business outcomes. This perspective comprises eight key capabilities that are essential for success.

- **Strategy Management:** Leverage cloud to accelerate your business outcomes.
- **Portfolio Management:** Prioritise delivery of high value cloud products and initiatives.
- **Innovation Management:** Leverage cloud to develop new, and improve existing process, products and experiences.
- **Product Management:** Manage data and cloud enabled offerings as products.
- **Strategic Partnership:** Build or grow your business through a strategic partnership with your cloud provider.
- **Data Monetisation:** Leverage data to obtain measurable business benefit.
- **Business Insights:** Gain real-time insights and answer questions about our business.
- **Data Science:** Leverage advanced analytics, and machine learning to solve complex business problems.

The Business Perspective plays a pivotal role in leveraging cloud investments to accelerate digital transformation and drive business success. It empowers organisations to become more agile, customer-centric, and competitive in the rapidly evolving digital landscape.



This is where a RACI can be very useful. RACI is a popular project management and organisational tool used to clarify the roles and responsibilities of individuals or teams involved in a project or process. It helps ensure that everyone understands their assigned tasks and that accountability is clearly defined. The term "RACI" stands for Responsible, Accountable, Consulted, and Informed, which are the four key roles involved in the process.

While the core team will lead the migration, the application teams will likely play a role in validating the migration plan and testing during cutover. Many organisations view cloud migration as an infrastructure project, but it's important to recognise that it's also an application migration. Failing to involve application teams can lead to issues during the migration process.

When selecting a migration strategy, it's recommended to consider the application team's required involvement. For instance, a rehost strategy may require less application-team involvement compared to a replatform or refactor strategy, which involve more changes to the application landscape. If application owner availability is limited, it may be preferable to use a rehost or replatform strategy rather than refactor, relocate, or repurchase strategies.

Validate That There Are No Licensing Issues When Migrating Workloads

To avoid potential licensing issues when migrating workloads to the cloud, it is important to validate that the licenses will still be valid in the new environment. It is possible that licensing agreements may be focused on on-premises infrastructure, such as CPU or MAC address, or may not allow hosting in a public cloud environment. Renegotiating licensing agreements can be time-consuming and may delay the migration project.

To prevent licensing issues, we suggest working with sourcing or vendor management teams as soon as the migration scope is defined. This can also impact the target architecture and migration strategy, so it is important to take licensing into account during the planning phase.

Training

Train Teams on New Tooling and Processes

After defining the migration strategy, it's important to assess what training is required for both the migration and the target operating model. Using new tooling, such as AWS Database Migration Service, can cause delays during the migration, so it's recommended to provide hands-on training to teams. Automation is also key to accelerate large migrations.

CAF - People Perspective

The People Perspective acts as a vital link between technology and business, expediting the cloud journey and enabling organisations to swiftly transition to a culture of continuous growth, learning, and embracing change as the new normal. This perspective encompasses seven key capabilities as follows:

- **Culture Evolution:** Evaluate, incrementally evolve, and codify organisational culture with digital transformation aspirations.
- **Transformational Leadership:** Strengthen leadership capability and mobilise leaders to drive transformational change.
- **Cloud Fluency:** Build digital acumen to confidently and effectively leverage cloud to accelerate business outcomes.
- **Workforce Transformation:** Enable talent and modernise roles to attract, develop and retain a digitally fluent and high performing workforce.
- **Change Acceleration:** Accelerate adoption to the new ways of working by applying a programmatic change acceleration framework.
- **Organisation Design:** Assess and evolve organisation design for alignment with the new cloud ways of working.
- **Organisational Alignment:** Establish ongoing partnership between organisational structures, business operations, talent and culture.

The People Perspective is critical in driving successful cloud transformation by nurturing a culture of growth, learning, and change within organisations. By focusing on the key capabilities, organisations can create an environment that empowers their workforce and accelerates their cloud journey.



Summary

Large-scale migration to the cloud requires a well-defined strategy, scope and timeline. This includes understanding the business drivers for the migration, identifying the workloads to be migrated, and developing a roadmap for the migration process.

In addition, successful cloud migration projects require a holistic approach that considers people, process, and technology. While it's important to have the right technology and processes in place, it's equally crucial to focus on the people involved in the migration. This includes identifying and engaging with stakeholders, establishing clear communication channels, and providing adequate training and support for employees.

In this section, we have focused on the people perspective of cloud migration, which is a critical aspect of any successful migration project. We have discussed the importance of establishing a clear scope and strategy for the migration project, as well as setting realistic timelines to ensure a smooth transition. In the next sections, we will delve deeper into these areas and provide insights and best practices for navigating the technical and procedural aspects of cloud migration.

CAF - Governance Perspective

Governance plays a vital role in providing control and oversight to ensure that cloud adoption aligns with strategic objectives and delivers value to the organisation. This perspective focuses on control and oversight, allowing you to maximise the benefits for your organisation. Within the governance perspective, there are seven key capabilities that are crucial to consider:

- **Program & Project Management:** Deliver interdependent cloud initiatives in a flexible and coordinated manner.
- **Benefits Management:** Ensure that the business benefits of your cloud investments are realised and sustained.
- **Risk Management:** Leverage cloud to lower your risk profile.
- **Cloud Financial Management:** Plan, measure, and optimise your cloud spend.
- **Application Portfolio Management:** Manage and optimise your application portfolio in support of your business strategy.
- **Data Governance:** Exercise authority and control over your data to meet stakeholder expectations.
- **Data Curation:** Organise an inventory of data products in a data catalogue.

The Governance Perspective plays a vital role in effectively orchestrating cloud initiatives while ensuring maximum organisational benefits and mitigating risks.



Cloud Migration: Strategy and Best Practices - Part 2

In the previous section on Cloud Migration Strategy and Best Practice we discussed the importance of having a well-defined strategy, a clear scope and realistic timeline for successful cloud migration projects. We also highlighted the critical role that people play in the success of cloud migration projects.

In this section, we will shift our focus to the technology perspective of cloud migration. We will explore how technology can be used to achieve the scale and velocity required, while aligning with the strategy, scope and timelines of the migration project. The key principle is to automate wherever possible, utilising tools such as discovery tools, migration implementation tools, configuration management databases, inventory spreadsheets, and project management tools.

Once the necessary tools are selected, it's essential to ensure that the migration team has the skills to use them effectively. With the right tools and skills in place, technology can play a critical role in accelerating large migrations.

Technology Perspective

In order to accelerate large migrations, technology can provide a solid foundation. One example of this is the Cloud Migration Factory solution, which focuses on end-to-end automation for migrations. This section explores some best practices for using technology to achieve the scale and velocity required, while also aligning with the strategy, scope, and timelines of the migration project.

The key principle here is to automate wherever possible. When dealing with thousands of servers, performing manual tasks can be a costly and time-consuming effort. To aid in the migration process, several tools are typically used, including discovery tools, migration implementation tools, configuration management databases (CMDBs), inventory spreadsheets, and project management tools. These are utilised at various stages of the migration, from assessment to mobilisation through to implementation. The selection of tools is determined by the business objectives and timelines.

Once the migration phases are planned and the necessary tools are selected, it's essential to ensure that the migration team has the skills to use them effectively. If there are any gaps in skills or experience, targeted training should be planned to ramp up the team's abilities. Additionally, it's beneficial to create events where teams can gain experience with the migration tooling in a safe environment.

CAF – Platform Perspective

This perspective is all about accelerating the delivery of your cloud workloads through a robust, scalable, and hybrid cloud environment. The Platform Perspective encompasses seven essential capabilities that are vital for success.

- **Platform Architecture:** Establish guidelines, principles, patterns and guardrails for your cloud environment.
- **Data Architecture:** Design and evolve a fit-for-purpose data and analytics architecture.
- **Platform Engineering:** Build a compliant cloud environment with the enhanced security features, and packaged, reusable products.
- **Data Engineering:** Automate and orchestrate data flows across your organisation.
- **Provisioning & Orchestration:** Create, manage and distribute catalogues of approved cloud products to end users.
- **Modern App Development:** Build well-architected cloud-native applications.
- **CI/CD:** Rapidly evolve and improve applications and services.

The Platform Perspective is a crucial framework for accelerating the delivery of cloud workloads and achieving success in your cloud initiatives.

By establishing guidelines, principles, and guardrails for your cloud environment, you can create a well-architected foundation that accelerates implementation, reduces risk, and drives cloud adoption.



For example, are there sandpit or lab servers that teams can migrate to gain experience with the tooling? Alternatively, can initial development workloads be used for learning purposes? With the right tools and skills in place, technology can play a critical role in accelerating large migrations.

Automation, Tracking and Tooling Integration

Automate Migration Discovery to Reduce the Time Required

When starting a large migration project, it's important to figure out what needs to be migrated and how to migrate it. This process is called discovery and it involves capturing key information about the workloads that will be migrated. To speed up the migration, it's essential to automate the discovery process and import the captured data into the migration factory. This significantly reduces the time and effort required to complete the discovery phase.

For example, you could automate your data intake process by hosting your migration metadata on Microsoft SharePoint and using an AWS Lambda function to load the data into the migration factory automatically. This would enable you to reduce manual work, minimise human error and speed up their migration process.

Automate Repetitive Tasks

During the migration implementation phase, there are many repetitive tasks that must be done frequently. For instance, if you're using AWS Application Migration Service (MGN), you'll need to install the agent on every server that's included in the migration. To handle these tasks efficiently and quickly, it's best to set up a migration factory tailored to your specific business and technical needs.

A migration factory uses a standardised dataset to speed up the migration process, and after identifying all the tasks involved, you can spend time automating as many manual tasks as possible with prescriptive runbooks. One example of a migration automation solution is the Cloud Migration Factory. It provides the foundations for automating aspects specific to your organisation. For instance, you may want to update a flag in your CMDB to indicate that the on-premises servers can now be decommissioned.

You could create an automation script that performs this task at the end of the migration wave, and Cloud Migration Factory would provide the centralised metadata store with all the wave, application, and server metadata. This way, the automation script can connect to Cloud Migration Factory, retrieve a list of servers in that wave, and take appropriate actions. Additionally, Cloud Migration Factory supports AWS Application Migration Service, which can further streamline your migration process.

CAF – Security Perspective

This perspective helps you achieve the confidentiality, integrity, and availability of your data and cloud workloads. A focus on security is paramount to establish a robust foundation that safeguards your organisation's assets and mitigates risks in the cloud.

- **Security Governance:** Develop and communicate security roles, responsibilities, policies, processes, and procedures.
- **Security Assurance:** Monitor, evaluate, manage, and improve the effectiveness of your security and privacy programs.
- **Identity and Access Management:** Manage identities and permissions at scale.
- **Threat Detection:** Understand and identify potential security misconfigurations, threats, or unexpected behaviours.
- **Vulnerability Management:** Continuously identify, classify, remediate, and mitigate security vulnerabilities.
- **Infrastructure Protection:** Validate that systems and services within your workload are protected.
- **Data Protection:** Maintain visibility and control over data, and how it is accessed and used in your organisation.
- **Application Security:** Detect and address security vulnerabilities during the software development process.
- **Incident Response:** Reduce potential harm by effectively responding to security incidents.

By implementing these capabilities, you can effectively manage security risks, protect your data, and respond efficiently to security incidents.



Automate Tracking and Reporting to Speed Decision Making

To speed up decision-making during migration projects, it's important to have a system in place that tracks and reports live data to all stakeholders involved in the project. This includes teams such as application, testing, decommissioning, architecture, infrastructure, and leadership. Each team needs access to live data to perform their roles and make decisions. To achieve this, we recommend building an automated migration reporting dashboard that tracks and reports on key performance indicators (KPIs) for the program.

For example, network teams need to know the upcoming migration waves to understand the impact on the shared connection between on-premises resources and AWS, while leadership teams need to know how much of the migration is complete. By having a dependable, automated live feed of data, miscommunications can be prevented, and decisions can be made based on reliable information. A large healthcare customer was able to simplify tracking and communications while increasing the migration velocity by using Amazon QuickSight to build automated dashboards that visualised the data.

Explore Tooling that Can Facilitate Your Migration

When it comes to managing a large migration, selecting the right tools is crucial. However, choosing the right tools can be a challenge, especially if your organisation lacks experience in managing large migrations. To ensure a successful migration, we recommend investing time in exploring the available tooling options to find the best fit for your specific needs. While some tools may come with a licensing cost, they can offer significant cost benefits in the long run. Additionally, you may find that your organisation already has tooling in place that can support your migration. For example, your application performance monitoring tooling can provide valuable discovery information about your estate.

Prerequisites and Post Migration Validation

Build the Landing Zone During the Pre-Migration Phase

To ensure a successful migration to AWS, it is recommended to build the target environment, or landing zone, ahead of time during the pre-migration phase. This means creating a well-designed and secure environment that includes monitoring, governance, and operational controls, among other things. By having the landing zone in place before the migration, you can minimise the risks and uncertainties that come with running your workloads in a new environment. Instead of building the VPCs and subnets during the migration wave, focus on building and validating the landing zone. This approach will help you ensure that the environment is well-architected and meets your business and technical requirements.

CAF – Operations Perspective

This perspective is a crucial aspect that ensures the effective delivery and management of cloud services. It focuses on optimising the health, availability, and performance of cloud services, aligned with the specific needs and goals of your organisation.

- **Observability:** Gain actionable insights from your infrastructure and application data.
- **Event Management (AIOps):** Detect events, assess impact, and determine the appropriate control action.
- **Incident and Problem Management:** Quickly restore service operations and minimise adverse business impact.
- **Change and Release Management:** Introduce and modify workloads while minimising the risk to production environments.
- **Performance and Capacity Management:** Monitor workload performance and ensure that capacity meets current and future demands.
- **Configuration Management:** Maintain a record of cloud workloads, their relationships, and configuration changes.
- **Patch Management:** Systematically distribute and apply software updates.
- **Availability and Continuity Management:** Ensure availability of business-critical information, applications, and services.
- **Application Management:** Investigate and remediate application issues in a single plane of glass.

This holistic approach to operations fosters agility, reduces downtime, and enhances the overall efficiency of cloud environments.



Once the landing zone is in place, you can then focus on migrating your workloads without worrying about managing the account or VPC-level aspects. By building the landing zone during the pre-migration phase, you can streamline the migration process and minimise disruptions to your business.

Outline Prerequisite Activities

To ensure a successful migration, it's crucial to outline the prerequisite activities that need to be completed before the migration takes place. Along with building the landing zone, it's essential to identify other technical prerequisites, especially those with a lengthy lead time, such as making necessary firewall changes. Communicating these requirements early on can help prepare and allocate the necessary resources, ensuring that the migration stays on track and meets the intended timeline.

Implement Post-Migration Checks for Continuing Improvement

To ensure continued improvement, it's equally important to implement post-migration checks. These checks can include operations integration, cost optimisation, and governance and compliance checks, among others. The post-migration phase is an excellent opportunity to implement cost-control operations, such as using Amazon CloudWatch to assess instance utilisation and determine whether a smaller-sized instance would be suitable.

A real-life example of the importance of the post-migration phase is a large technology customer who didn't include it initially. After migrating more than 100 servers, they discovered that the AWS Systems Manager Agent (SSM Agent) wasn't configured correctly, causing the migration to stall. Additionally, they found that the instances were much larger than initially estimated, which would have resulted in higher costs if left unchecked. As a result, the customer implemented a cost checkpoint at the end of each migration wave to avoid similar issues in the future.

Summary

Successful cloud migration projects require a holistic approach that considers people, process, and technology. In this article we have focused on the technology perspective of cloud migration, which is a critical aspect of any successful migration project. The automation of migration discovery, repetitive tasks, tracking, and reporting can significantly reduce the time and effort required to complete a migration project. By automating these aspects, migration projects can accelerate the migration process while aligning with the project's scope, strategy, and timelines. To ensure a successful migration, it is crucial to explore tooling that can facilitate the migration process. In the next section, we will delve deeper into the process perspective and provide insights and best practices for navigating the procedural aspects of cloud migration.

Cloud Operating Model (COM)

Establishing a well-designed Cloud Operating Model (COM) is crucial for the successful adoption of cloud technology within an organisation.

A successful Cloud Operating Model empowers organisations to operate applications in the cloud with increased speed, innovation, and business value, all while maintaining reliability and security.

Failure to transform operating models can result in a phenomenon known as the "great stall," where adoption momentum slows or halts.

Establishing a cloud delivery and governance function, often referred to as a Cloud Centre of Excellence (CCoE) or Cloud Enablement Engine (CEE), has proven to be a significant factor in avoiding this effect.

Key Components of the Cloud Operating Model:

- Cloud Adoption Framework (CAF)
- Cloud Enablement Engine (CEE)
- Cloud Business Office
- Cloud Platform Engineering (CPE)
- Cloud Foundation team
- Operations Domain Framework



Cloud Migration: Strategy and Best Practices - Part 3

As organisations increasingly adopt cloud technologies, the process of migrating large-scale workloads to the cloud has become a critical undertaking. However, running a large migration presents unique challenges that requires meticulous planning and execution from the perspectives of people, process and technology.

In the previous two sections on Cloud Migration Strategy and Best Practices, we discussed the importance of having a well-defined strategy, a clear scope, and realistic timeline for successful cloud migration projects. We also highlighted the critical role that people and technology play in the success of cloud migration projects. In this article, we will shift our focus to the process perspective of cloud migration in terms of preparing for a large migration and running a large migration.

Process Perspective

When it comes to large-scale migrations, having a well-defined process in place is critical. While processes bring consistency, they must also be adaptable to each project's unique requirements. Running the process repeatedly will help you identify gaps and areas for improvement, leading to significant benefits as you iterate, learn, and adopt new ideas.

Managing processes in migrations can be challenging as they often span multiple technologies and boundaries that may not have been linked before. This guide provides processes and guidance on specific requirements for large migrations, helping you achieve success while maintaining quality and team confidence.

Preparing for a Large Migration

To ensure a successful migration journey, it is crucial to establish core principles that provide a clear direction and obtain buy-in from stakeholders. In this section, we will cover the following topics:

- Define business drivers and communicate strategy, cope, and timeline.
- Define a clear escalation path to help remove the blockers.
- Minimise unnecessary change.
- Document an end-to-end process early.
- Document standard migration patterns and artifacts.
- Establish a single source of truth for migration metadata and status.

Cloud Enablement Engine (CEE)

CEEs—also known as Cloud Centres of Excellence or Cloud Enablement Teams—comprise small teams of cloud experts, drawn from different roles within the organisation, such as developer, network engineer, database administrator, or security or finance expert. They are dedicated to evangelising and institutionalising best practices and frameworks and managing the organisation's leap to the cloud.

Embracing the cloud as an “enablement engine” necessitates a shift in focus toward technology at almost all levels of the business operations. Naturally, this entails change for everyone involved. CEEs help manage this change as the single owner for the organisation's cloud initiatives, maintaining certainty and efficiency at every stage of the journey.

Building a successful CEE can be separated into five phases:

- Establishing the core team
- Training and coaching
- Advancing the pilot project
- Architecting for the cloud
- Operating in the cloud

The CEE consist of two functional domains:

- Cloud Business Office (CBO)
- Cloud Platform Engineering (CPE).



Define Business Drivers and Communicate Strategy, Scope and Timeline

Defining business drivers and having a clear communication plan for the strategy, scope and timeline are vital for large migrations to AWS. Different migration paths can be considered, such as rehosting workloads, containerising applications, or redesigning them into serverless architecture. To determine the appropriate migration path, it is important to align with business drivers.

Involving various stakeholders, including application owners, network teams, database administrators, and executive sponsors, is crucial. Documenting business drivers and setting key performance indicators (KPIs) aligned with target outcomes helps ensure stakeholder alignment and effective decision-making.

Define a Clear Escalation Path to Help Remove Blockers

Large cloud migration programs involve multiple stakeholders with their own priorities, which can create challenges. To address this, a clear escalation path must be established to outline the necessary actions for removing any blockers that may arise. This streamlines decision-making processes and ensures alignment among teams. An example of resolving conflicting migration paths is setting a clear mandate following an escalation to the Chief Information Officer (CIO) and implementing a mechanism for requesting required decisions.

Minimise Unnecessary Change

While change is beneficial, excessive changes can introduce additional risks. When a business case for a large migration is approved, it is recommended to set a two-week rule to prevent application teams from spending excessive time rewriting their applications. This rule helps maintain consistency and enables a sustainable migration process over a multi-year period. By minimising changes that do not align with the desired business outcomes, mechanisms can be developed to manage such changes in future projects.

Document an End-to-End Process Early

Comprehensive documentation of the entire migration process is essential for effective planning. This documentation should assign ownership of tasks and processes to specific stakeholders, ensuring clarity of roles and responsibilities. It also helps identify potential issues and facilitates ongoing improvements.

Existing processes, dependencies, and integration points should be documented, and a RACI matrix can be created to assign responsibilities and accountabilities. Additionally, establishing a countdown plan, working backward from the workload migration cutover date and time, provides a structured approach.

Cloud Business Office (CBO)

The CBO focuses on aligning the CEE's products and services with the needs of enterprise customers and leadership. It takes charge of business governance and people enablement aspects of cloud adoption.

CBO Capabilities

The CBO's responsibilities include:

- Establishing the overall cloud change strategy, which the CEE will deliver and enable, to drive successful implementation across the organisation.
- Ensuring alignment between enterprise architecture and the CEE.
- Developing processes to evaluate and create new cloud patterns that support teams adopting cloud.
- Understanding customer requirements and demand for cloud products, and translating them into a prioritised backlog of work.
- Managing the delivery of items within the CPE and CBO backlogs.
- Providing mechanisms to accurately allocate, forecast, and optimise spending by cloud consumers.
- Enabling self-service capabilities for consumers and executives to manage current and projected spending.
- Guiding consumer teams through the migration process to the cloud, including training, deployments, migration, and transitioning to steady-state operation.



Document Standard Migration Patterns and Artifacts

Documenting standard migration patterns and artifacts is critical for success. These resources serve as reusable references, documentation, and runbooks for future migration projects, enabling avoidance of past pitfalls and issues. Standard processes and artifacts significantly accelerate the migration process and improve consistency.

It is recommended to establish central ownership of these documents and artifacts, with a process for submitting recommended changes. Regularly sharing updates and changes with all teams promotes effective communication and ensures consistency throughout the migration project.

Establish a Single Source of Truth for Migration Metadata and Status

Creating a single source of truth for migration metadata and status is essential for effective planning. This allows all teams to align and make data-driven decisions. Initially, multiple data sources may exist, such as configuration management databases (CMDBs) or inventory lists. Data capture mechanisms, like using discovery tooling or surveying IT leaders, may be necessary. Aggregating all data sources into a single dataset simplifies tracking the migration progress, including the status of migrated servers.

Running a Large Migration

Once the business outcomes have been established and the migration strategy has been communicated to the stakeholders, it is time to plan how to divide the scope of the large migration into manageable migration events or waves. The following sections provide essential guidance for creating a wave plan.

Plan Migration Waves Ahead of Time to Ensure a Steady Flow

Thorough planning is crucial for the success of the migration program. Planning migration waves in advance allows the project to progress smoothly and enables the team to be proactive in addressing migration requirements. It facilitates scalability, enhances decision-making, and improves forecasting as project demands become more complex. Additionally, planning ahead enhances the team's adaptability to changes. For instance, a financial services customer working on a data centre exit program initially faced delays due to sequential wave planning.

When stakeholders were informed about their applications' migration to AWS, they still had several tasks to complete before starting the migration, causing significant program delays. To address this, the customer implemented a holistic approach where migration waves were planned months in advance. This provided ample time for application teams to complete pre-migration activities and eliminated unnecessary delays.

Cloud Platform Engineering (CPE)

Underpinning the CBO is Cloud Platform Engineering (CPE), which is responsible for codifying the differences between stock AWS service configurations and enterprise standards applicable within the organisation. The CPE's role is to package and continuously improve the cloud platform as a set of self-service deployable products for customers and consumers.

CPE Capabilities

The CPE teams have the following responsibilities:

- Establishing core and shared platform capabilities and codified patterns to facilitate self-service deployments via a service catalogue and templates.
- Building the operational platform and shared capabilities required for automated build and release processes, end-to-end operations, integration of operations products, self-service deployments, alerts, and reporting.
- Creating codified corporate security policies and controls in the cloud, leveraging automation and self-service tools whenever possible.
- Proactive assessment and monitoring of the environment to enforce security policies and mitigate threats.
- Emphasizing automation as a central element of the product mentality and the overall CPE delivery.



Keep Wave Implementation and Wave Planning Separate

Separating the teams responsible for wave planning and wave implementation allows both processes to work concurrently. With effective communication and coordination, this approach avoids slowdowns in the migration caused by insufficiently prepared servers or applications. It is crucial to involve the migration implementation team during wave planning to ensure complete and accurate data collection. Additionally, creating a buffer between wave preparation and implementation is essential. Collaboration between the wave planning team and the migration team is necessary to gather the right data and minimise the need for rework.

Start Small for Great Outcomes

Starting with a small-scale initial wave and gradually increasing migration velocity in subsequent waves leads to favourable outcomes. The first wave should involve a single, small application with fewer than 10 servers. As the migration progresses, additional applications and servers can be included in subsequent waves, gradually building up to the target migration velocity.

Prioritizing less complex or risky applications and incrementally ramping up the migration velocity allows the team to adjust to working together and learn from the process. With each wave, the team can identify and implement process improvements, significantly enhancing the velocity of later waves. For example, a customer migrating over 1,300 servers in a year began with a pilot migration and a few smaller waves.

This approach allowed the team to identify opportunities for improvement, optimise network segments, collaborate with the firewall team to prevent delays, and develop automation scripts for discovery and cutover processes. Starting small enabled the team to focus on process enhancements and increased overall confidence.

Minimise the Number of Cutover Windows

Maintaining discipline in managing scale is crucial for successful mass migrations. Limiting the number of weekly cutover windows ensures that the time spent on cutover activities is maximised. By reducing flexibility in this area, unnecessary delays and operational burdens associated with scheduling are minimised. For instance, instead of having multiple small cutovers, consolidating servers into fewer, larger cutovers optimises operational efficiency and reduces potential delays.

A large technology company experienced delays early in their migration project due to application teams having the flexibility to dictate migration schedules until the last minute. This resulted in constant negotiation and stress for the migration team. To address this, the company improved their planning discipline and reduced the number of cutover windows, avoiding delays in meeting data centre contract expiration dates.

Cloud Financial Management (CFM)

Cloud Financial Management (CFM), also known as Cloud FinOps, is the application of cloud cost management best practices and financial governance to cloud usage, to achieve the most cost-efficient business outcomes.

CFM practices are grouped into four pillars:

- 1. Planning and Forecasting:**
The use of tools and best practices to plan future cloud cost and consumption.
- 2. Measurement and Accountability:** Monitoring and measurement of consumption, cost, and performance metrics to inform and improve financial management, and enable more accountability.
- 3. Cost Optimisation:**
Application of strategies, such as resource and demand management, modernisation, as well as pricing models to incrementally reduce the cost of cloud hosting associated with required service levels.
- 4. Cloud Financial Operations:**
The systematic and standardised application of financial tools and business processes to govern cloud operations and ensure ongoing efficiency and effectiveness.



Fail Fast, Apply Experience, and Iterate

It is common for initial migration waves to encounter challenges and setbacks. Failing early in the process allows the team to learn, identify bottlenecks, and apply lessons learned to subsequent waves. During the initial stages of a migration, the team needs time to adjust, integrate various tools and people, and continuously improve the end-to-end process. Understanding and communicating that initial issues are expected is crucial, as some teams may be reluctant to embrace new approaches and failure.

Ensuring everyone understands that these challenges are part of the journey encourages the team to learn, adapt, and ultimately achieve a successful migration. For instance, a company planning to migrate over 10,000 servers in 24-36 months began with learning waves to understand the processes and permissions involved. Through iterative improvements, such as integrating with CMDB and CyberArk, the team increased their migration velocity to over 120 servers per week within six months.

Don't Forget the Retrospective

Conducting retrospectives is an essential part of an agile process. These sessions allow the team to reflect, discuss, learn, and make necessary adjustments before moving forward. Retrospectives provide a structured approach to capturing lessons learned, which can then be used to drive improvements. For large migrations to succeed, constant evolution and improvement of processes, tools, and teams are vital. Retrospectives play a significant role in this continuous improvement cycle.

Instead of waiting until the end of the program, lessons learned from previous waves should be applied to the planning of subsequent waves. Regular retrospectives provide opportunities to identify areas for streamlining, process improvements, and automation. By implementing a countdown schedule and automating manual tasks, one customer significantly minimised delays and optimised their cutover process. Another large tech company held regular retrospectives that led to improvements in processes, scripts, and automation, resulting in a 40% reduction in average migration time over the course of the program.

Conclusion

Large migrations present different challenges when compared to smaller migrations. This is mostly due to the complexities introduced by the scale. Running a large migration requires meticulous planning and execution as well as effective coordination, and a focus on continuous improvement. By following the guidance provided in this three-part series, organisations can navigate the complexities of large-scale migrations and achieve successful outcomes.