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# AWS migration readiness, planning, and execution



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# Abstract

Organisations are making decisions to move their applications to the cloud at an accelerating pace.

Amazon Web Services (AWS) is the pioneer of public cloud. It remains the leading public cloud provider at this time. AWS provides a secure, scalable, cloud computing platform with high availability where you can run your applications.

This white paper is intended for those considering planning a migration of their applications to the AWS cloud. It presents an overview of best practices and methodologies for migration readiness and moving your applications to AWS, based on real-world learnings.



# Introduction

The scale of cloud adoption has been considerable to date and it shows no sign of slowing down. There are several cloud providers in the market offering cloud infrastructure and other services. Here we focus purely on AWS.

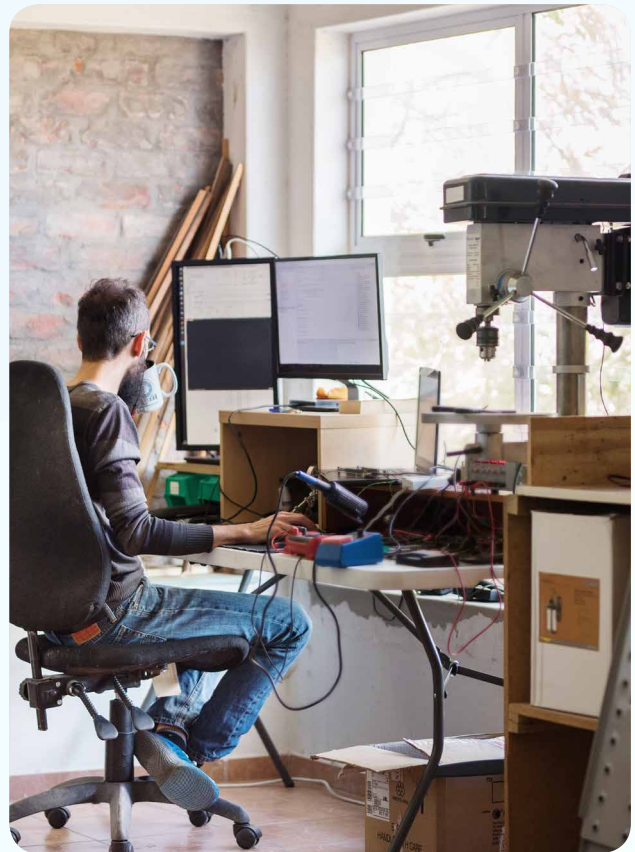
This white paper walks through best practices and methodologies for migrating applications. They are presented in order of migrations life cycle. The bulk of content covers migration readiness, migration planning, and migrating at scale. Below are the core sections:

- 1** Cloud adoption (common scenarios)
- 2** Migration readiness (assess)
- 3** Migration planning (mobilise)
- 4** The well-architected framework
- 5** Migrating at scale (migrate and modernise)

# Overview

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The events of 2020 allowed chief information officers to overcome any reluctance of moving mission-critical workloads from on-premises to the cloud.<sup>1</sup>



Common considerations to think about when planning for a successful cloud migration include security, governance, and technology platforms. A migration readiness assessment provides a means to consider organisational strengths and challenges on the path that lays ahead. The AWS cloud adoption framework is a standardised framework developed for this purpose. Using a standardised assessment framework provides a means to utilise leading industry knowledge and baseline the complexity of organisational change.

Despite macroeconomic headwinds, offerings that support or deliver public cloud services are experiencing tremendous growth. Enterprises are moving their workloads from on-premises equipment to public cloud environments. Moving environments, applications, and operations to the cloud requires a consistent focus over time, and a unique set of migration skills.

Whether you are moving out of a data centre and shifting applications in volume or moving a smaller set of carefully targeted applications, it is critical to plan for success.

Migration readiness is a facilitated leadership level assessment. It provides valuable leadership insight. The assessment is not simply a review of technical capability. It covers broader organisational considerations, as touched on earlier.

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**Proper planning prevents poor performance.**

<sup>1</sup> Cloud Spending Driven by Emerging Technologies Becoming Mainstream, April 2021, Gartner Press Release, <https://www.gartner.com/en/newsroom/press-releases/2021-04-21-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-grow-23-percent-in-2021>

## Cloud adoption framework

The cloud adoption framework covers six broad perspectives that provide outputs for planning organisation-wide cloud adoption:



Governance



People



Business



Security



Platforms



Operations

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The cloud is a means, not an end. Success in modernising IT through the cloud is driven by a complete standardisation and automation strategy.<sup>2</sup>

## Planning migration

With assessment outputs in hand, there are a number of dimensions to consider when planning migration of applications to the cloud. Some of the dimensions in preparing for migration include areas such as:



Culture



People



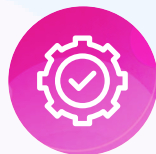
Skills



Business drivers



Costs



Operating model



Security



Compliance

<sup>2</sup> Cloud adoption to accelerate IT Modernization, April 2018, McKinsey Digital, <https://www.mckinsey.com/business-functions/mckinseydigital/our-insights/cloud-adoption-to-accelerate-it-modernization>

We work through these planning dimensions during migration planning. They come in to play from early high-level planning and into detailed planning throughout the migration life cycle.

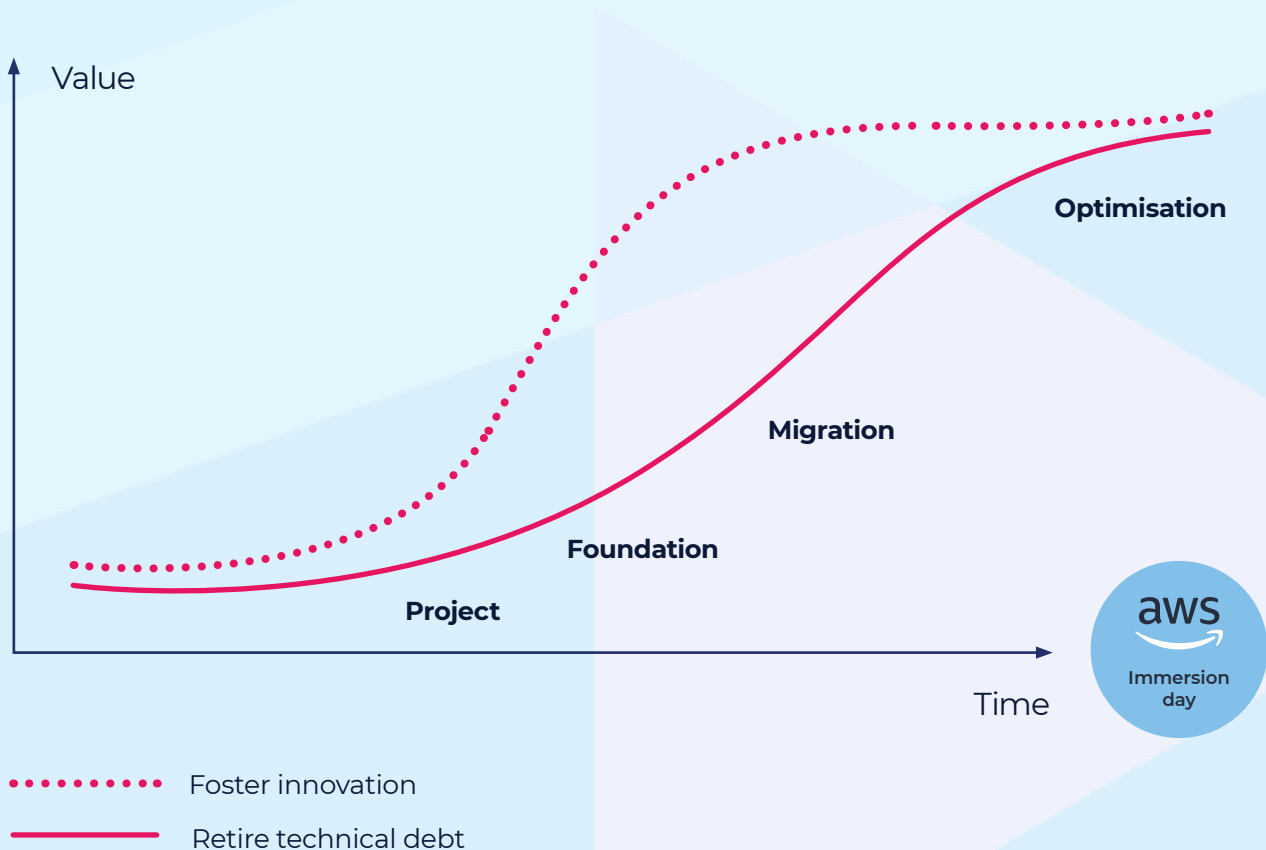
Migrating to the cloud is an iterative process that builds to work at scale. We start to build experience through early projects, setting a foundation, and larger migration work. Standardisation and automation contribute to a successful outcome.

The AWS well-architected framework provides a standardised approach to managing successful outcomes, with pillars that focus on operational excellence, security, reliability, performance efficiency, and cost optimisation.

Through 2020 and 2021, cloud services were a blessing for keeping the economy from grinding to a halt. Enterprise technology professionals will adjust their cloud strategies with one eye on pandemic response and the other on digital transformation initiatives.

Best practices for migrating applications to the cloud involve starting with a migration readiness assessment, planning for migration, building a foundation, standardizing and automating, and iteratively building migration experience. Using the AWS well-architected framework will provide a standard.

## Stages of adoption



# Cloud adoption

## (common scenarios)

There are many reasons to consider migrations of applications into the cloud. Each organisation has its own unique considerations to take into account. However, there are common organisational drivers for cloud adoption across the board, such as:

- Organisational agility, e.g., speed to market and ability to pivot effectively during product development
- Productivity improvements, e.g., automation of repetitive tasks to enable focus on higher value organisational activities
- Cost management through efficiency and avoidance, e.g., improving operational costs and avoiding potential future costs, respectively
- Improving technology platform resilience to increase uptime and availability of services

### Common scenarios that create a need or focus for migration include:

- Moving out of a data centre – this may be due to the end of a lease, a desire to leverage modern services such as serverless computing or artificial intelligence (AI)
- Implementing data-driven decisions – unlocking data from legacy applications or improving organisational agility using near real-time insights from the data
- Upgrading enterprise resource planning (ERP) systems – vendor support may have reached end-of-life or the cost of integration with older ERPs may lead to a decision to upgrade the ERP<sup>3</sup>

- Business continuity – regulatory oversight or disaster recovery test findings lead to a demand to improve. For example, the resilience of business platforms must be improved, or the actual time to recover from a disaster is not acceptable.

These drivers and scenarios are seen in trends affecting the IT industry as noted in IDC's Top 10 IT Industry Trends for 2021 report<sup>4</sup>.

## Top 10 IT industry trends for 2021

1. The shift to cloud-centric accelerates
2. Edge becomes a top priority
3. The intelligent digital workspace
4. The pandemic's IT legacy
5. Resiliency is central to the next normal
6. A shift towards autonomous IT operations
7. Opportunistic AI expansion
8. Relationships are under review
9. Sustainability becomes a factor
10. People still matter

<sup>3</sup> 5 signs it's time to upgrade your ERP system, February 2018, CIO.com, <https://www.cio.com/article/3254525/5-signs-its-time-to-upgrade-your-erp-system.html>

<sup>4</sup> IDC's Technology Trends For 2021, 2 November 2020, Forbes, <https://www.forbes.com/sites/peterhigh/2020/11/02/idctechnology-trends-for-2021/?sh=176506d935ce>



# Migration readiness


(assess)

Judging readiness for change is a critical step in the change life cycle framework presented in PMI's (2013) *Managing Change in Organisations: A Practice Guide*. It is the second consideration in the process of moving a strategic priority to a successfully implemented and well sustained new operational reality.<sup>5</sup>

## Overview

Running a readiness assessment is the first step in understanding organisational capability regarding cloud migrations. The six perspectives of the AWS cloud adoption framework cover organisational and technology capabilities. Each capability has a varying range of stakeholders that span the breadth of an organisation.

## The AWS cloud adoption framework

 Business	 Platforms
 People	 Security
 Governance	 Operations

## Organisational perspectives

The three organisational perspectives are: business, people, and governance.

- The business perspective considers value realisation regarding cloud adoption. It identifies the alignment of IT with business objectives with a view to ensuring a sound business case and initiatives are prioritised accordingly, amongst other things. This perspective reviews IT finance, IT strategy, benefits realisation, and business risk management capabilities.
- The people perspective addresses roles and responsibilities in relation to cloud adoption. It looks at the changing nature of organisational structure, staffing skills mix, and change management needs to make the cultural transition. The capabilities assessed in this perspective are resource management, incentive management, career management, training management and organisational change management.
- The governance perspective has a focus on prioritisation and control. This perspective is concerned with effectively managing the organisational value and risk of IT investments via the skills and processes required. For example, providing the greatest value to the organisation when investing in migrating applications to the cloud, whilst limiting risk to the organisation. The capabilities assessed for governance are portfolio management, programme and project management, business performance measurement and licence management.

## Technology perspectives

The three technology perspectives are platform, security, and operations.

- The platform perspective concentrates on applications and infrastructure. Organisations understand their applications and infrastructure using blueprints provided by their IT architects and designers. Architectural frameworks and models are used as lenses to blueprint IT systems for this purpose. The capabilities of the platform perspective focus on a standard means to communicate cloud architectures. They are compute provisioning, network provisioning, storage provisioning, database provisioning, systems and solution architecture, and application development.
- The security perspective is allied with organisational risk and compliance. Security in the cloud is paramount, as it is on-premises. Highly sensitive organisations can take advantage of leading cloud data centre and network architectures, which are designed to facilitate security objectives including visibility, auditability, and control. AWS meets PCI DSS v3.2.1, NIST, ISO 27001, and ACSC ISM standards, amongst many others. The capabilities of the security perspective are identity and access management, detective control, infrastructure security, data protection, and incident response.
- The operations perspective is concerned with managing IT workloads to agreed service levels. IT operations support organisational operations departments that are tasked with running day-to-day management of services. The capabilities in the operations perspective are service monitoring, application performance monitoring, resource inventory management, release management / change management, reporting and analytics, business continuity / disaster recovery, and IT service catalogue.

## Reviewing findings and moving to mobilise

A migration readiness assessment reviews stakeholder input on these capabilities defined in the AWS cloud adoption framework.

The outcomes of an assessment (such as collated answers to questionnaires and interviews, adoption readiness heatmap) provide information to consider when planning the organisational change areas that set up for a successful migration.

The assessment process identifies gaps to address and makes recommendations to fill those gaps in preparation for migration to the cloud.



# Migration planning

(mobilise)

With a migration readiness assessment in hand and having considered recommendations to address potential organisational gaps (including technical gaps), it is time to plan applications migration.

There are eight best-practice dimensions that are considered when planning for success:

- Applications portfolio
- Business case
- Operating model
- Security, risk, and compliance
- Migration experience
- People, skills, and culture
- Landing zone
- Migration plan

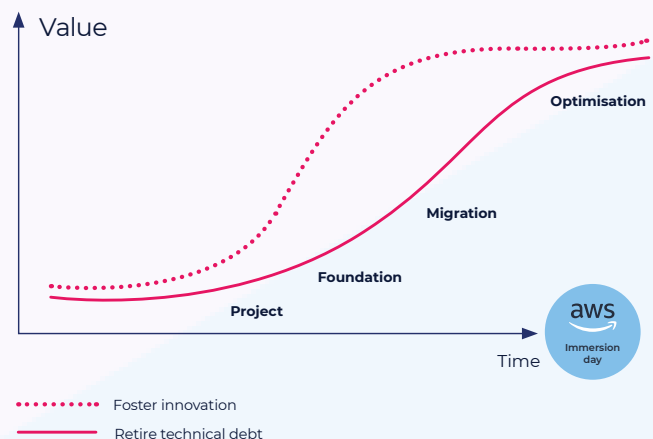
The planning process is often phased iteratively to first consider a high-level migrations plan, business case, operating model, etc., and then get into detail as required. A high-level business case can provide a total cost of ownership in an order of magnitude acceptable to provide seed funding that will get more detail. More detailed migrations plans, business case, operating model etc., can then follow throughout further iterative phases. Pre-defining an operating model, planning for security, risk, and compliance in advance,

and preparing a scalable people, skills, and culture setup all build organisational capability. Whilst the work involved should not be underestimated, the resulting capability of cloud migration and operational competencies provides a core means to run an organisation at internet speed.

Planning in some initial cloud migration experience helps to prove the promise of cloud migration and operational competencies, as well as learning experiences for the forming teams and change of culture. A pilot is recommended, for example a minimum viable product or a small set of applications that will benchmark performance and demonstrate functionality in cloud. Running a pilot also builds essential skills in migrating and operating in the cloud.

Once the planning stage is completed, an organisation is ready to migrate-at-scale and to move towards higher-levels of cloud adoption, such as innovation, optimisation, and modernisation (see diagram).

## Stages of adoption



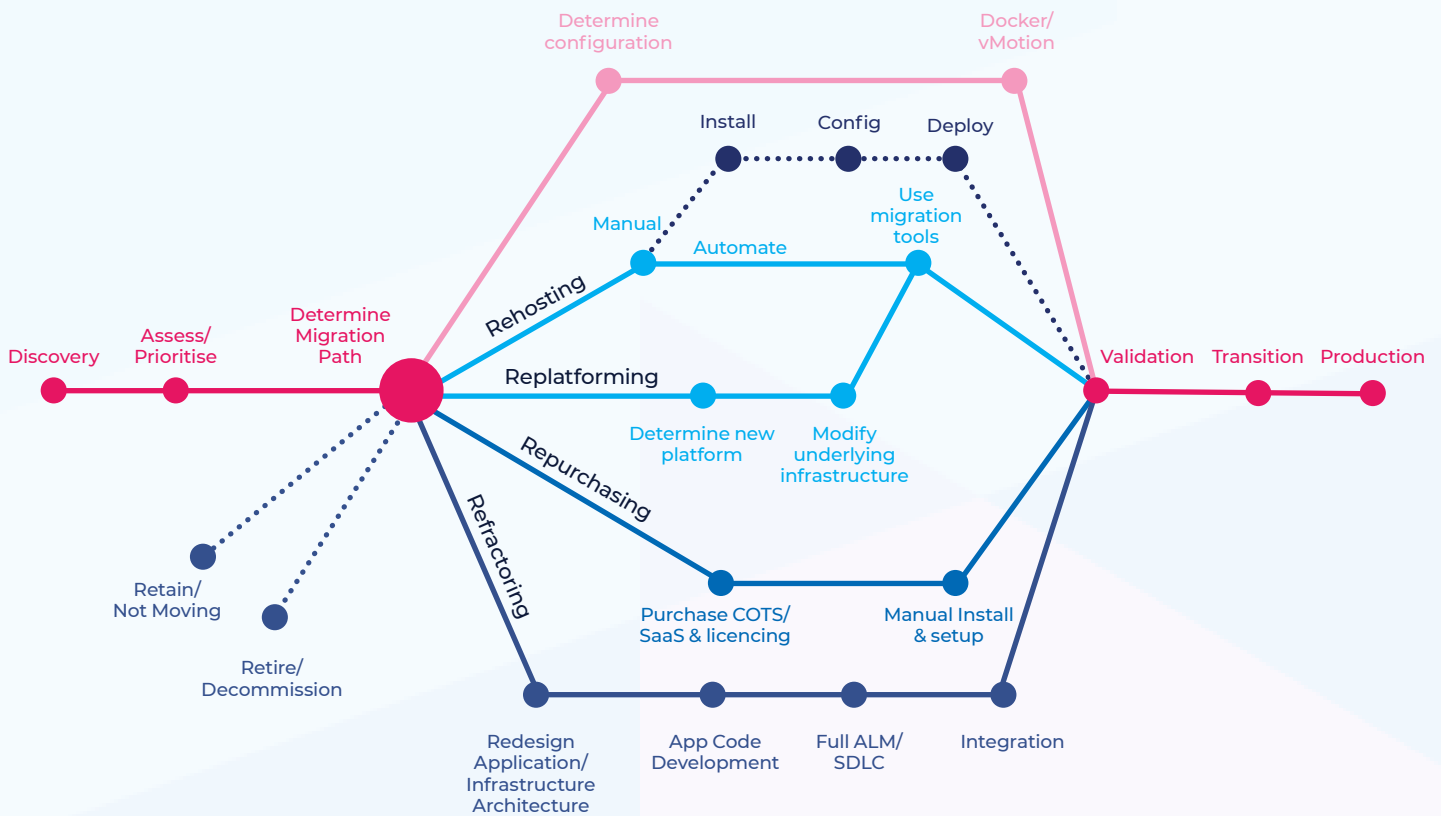
## Application portfolio

Begin a migration plan by analysing the applications running in your on-premises environment. This involves building an accurate picture of the applications portfolio by cataloguing physical and virtual servers, applications running on them and the current environment. With this catalogue applications can be grouped into categories and patterns.

With a complete data set that reflects the current application portfolio and environment, some analysis can be completed. For example, 70 per cent of databases are MySQL and 30 per cent are Microsoft SQL Server; 80 per cent of servers are running windows; 60 per cent of servers are production servers. These insights provide a basis for planning migration.

## Migration planning and strategies

A holistic discovery and assessment process drives decision making for the initial and long-term migration patterns selection.



<b>Re-host, or lift-and-shift</b>	<b>Re-platform, or lift-and-reshape</b>	<b>Re-factor, or redesign</b>	<b>Re-purchase, or drop and shop</b> e.g., move from perpetual licenses to subscriptions
<b>Retire</b> e.g., remove the application from active service	<b>Retain</b> e.g., leave as-is, where it is	<b>Relocate</b> similar to lift-and-shift — to move applications, etc containers, or VMC	

## Case study

# Re-factoring an application:

# Australian Organ Matching System project

An example of re-factoring an application is the Australian Organ Matching System project (AOMS). Datacom was selected to replace and modify the existing National Organ Management Service (NOMS). The new AOMS solution was specifically designed to not only replicate the existing business functionality, but also to significantly remodel the underlying architecture of the solution to be adaptable, flexible, and extensible.

## Business case

A sound business case presents a compelling reason to make an investment, with clearly identified benefits, and a cost analysis. With a firm grasp of the applications portfolio, based on organisational evidence (such as data from application portfolio discovery tools), a run cost analysis can be conducted.

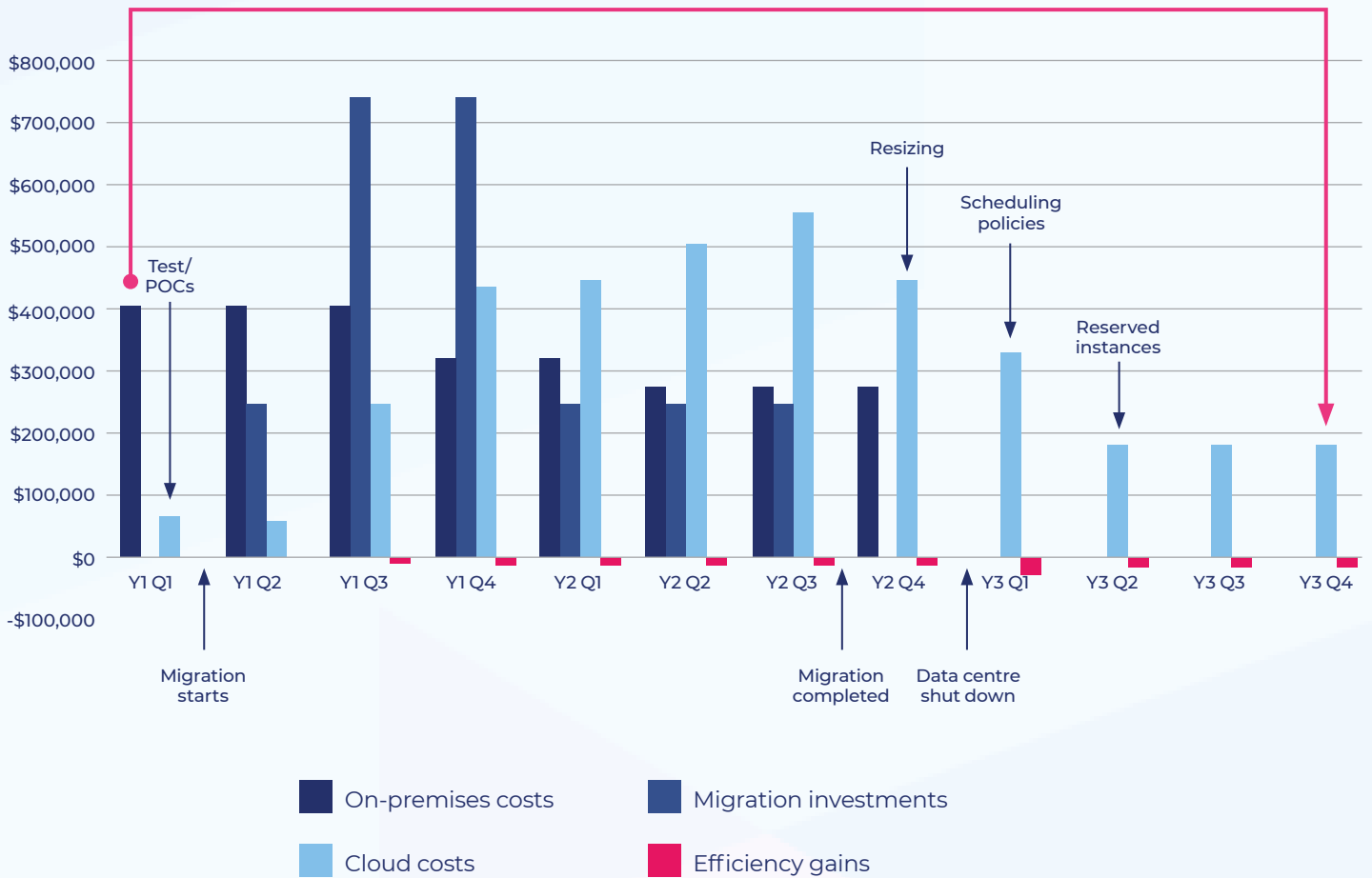
The example diagram over the page from Gartner Blog Network <sup>6</sup> shows a breakdown of the total cost of ownership of a move to cloud infrastructure over a three-year period.

This is a powerful visualisation that all organisations can use to present projected on-premises costs, migration investments, cloud costs, and efficiency gains of a business case to migrate applications to the cloud.

There is, of course, a cost to adopting cloud infrastructure. The migration investments category, as shown in the bar chart, represent these costs.

<sup>6</sup> Is Public Cloud Cheaper Than Running Your Own Data Center, November 2018, Gartner Blog Network, <https://blogs.gartner.com/marco-meinardi/2018/11/30/public-cloud-cheaper-thanrunning-your-data-center/>

## Example TCO Migration to Cloud IaaS over 3 years



How are the costs attributed? Common items in the cost of change include migration planning / consulting costs, cost of running environments in parallel (until full cutover to cloud infrastructure), cost of changes to applications, licensing, migration tooling, and change management (such as changes to establish a cloud centre of excellence, governance).

On the other hand, there must be some benefit to adopting cloud infrastructure. What is the return on the investment? What value does the organisation realise during or after migrating applications and adopting the cloud?

There are workforce productivity and efficiency gains such as reductions in provisioning, racking, patching of infrastructure, and improvements to productivity through automation.

As organisational skills develop there is also the promise of faster time to market, capability to scale services, improved resilience, and cost avoidance such as no need to refresh servers on a capital expense basis.

The business case is defined at a high-level and can be refined in further levels of detail, in iterative phases of migration planning.

## Case study

### Benefits of migrating:

# Department of Environment, Land, Water and Planning



An example of the benefits of migrating applications to AWS comes from the Victoria State Government Department of Environment, Land, Water and Planning (DELWP).

Early in 2020, DELWP wanted to strengthen the resiliency of its infrastructure and existing applications that formed part of the state's critical emergency infrastructure. A business case to migrate the applications to AWS has led to benefits realisation of 60–65 per cent reduction in cost to operate services, multi-site disaster recovery capabilities that improve service availability, Oracle database cost reductions, and data centre exit avenues opening up across the department.<sup>7</sup>

<sup>7</sup> A Win At The AWS Global Public Sector Partner Awards, June 2021, Datacom News, <https://datacom.com/au/en/about-us/news/latestnews/a-win-at-the-aws-global-public-sector-partner-awards>

## Operating model

Defining and planning an operating model to support and maintain cloud infrastructure migrated applications is a fundamental pillar in successfully moving to the cloud. This is closely linked with the people, skills, and culture changes that will be needed to operate effectively and successfully realise organisational benefits as touched on above.

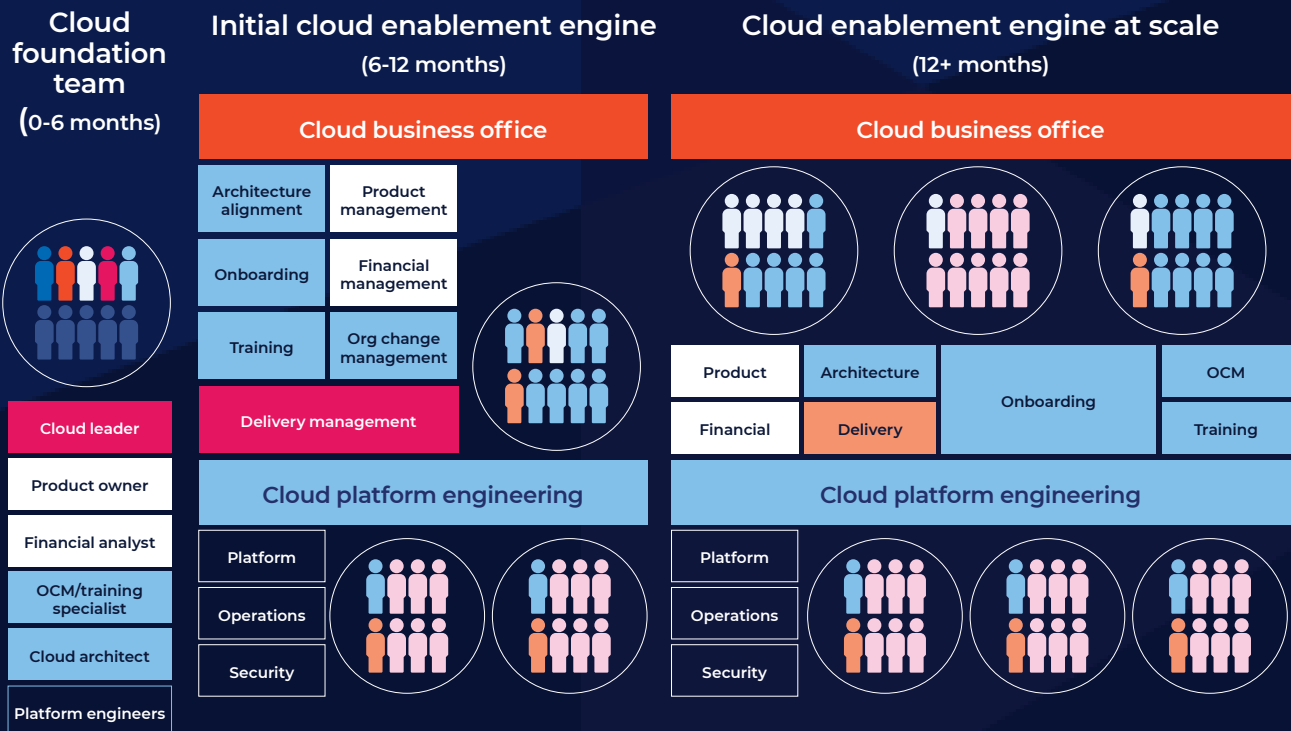
A cloud operating model requires a cloud services organisation that will centralise and share the expertise essential to realising organisational value of cloud adoption.

Core functions for cloud services are a cloud business office and a cloud engineering and operations team.

It is important to understand that there will be different modes of operation to support, because applications, products and services will be used differently across the organisation. The core functions must be able to support these use cases to attain benefits such as business agility and productivity improvements.

Managed services are a means that can be used to optimise cloud adoption and reduce the organisational time needed to solve common operational problems in the early stages of the adoption life cycle.

## Evolve your Operating model





## Case study

# Transitioning to the cloud:

# Victoria State Water Register



Relating to a real-world example again in the case of the Victoria State Water Register (VWR), VWR adopted Datacom managed services during a migration to AWS to facilitate the transition to a cloud operating model.

Datacom provided a resource unit (RU) catalogue for managing AWS infrastructure, along with enabling services including:

- Automated deployment and build from images (infrastructure as a service)
- Network setup and security based on high security reference architecture from vendors
- Configuration management to defined hardening standards.

These services enable VWR teams to focus on managing their applications, whilst Datacom operate the AWS cloud infrastructure.

## Security, risk, and compliance

Managing security, risk, and compliance of cloud infrastructure and services is well documented. The levels of compliance provided by AWS are second to none of the leading cloud providers. Common frameworks used by organisations include ISO27001, NIST, PCI DSS, SOC1, and FIPS 140-2, and these frameworks are covered along with many others.<sup>8</sup>

Five core themes from the AWS cloud adoption framework provide a foundation for securing AWS cloud infrastructure and managing risk. These security themes are applied using the concept of a virtual data centre.

The five core themes are identity and access management, logging and monitoring, infrastructure security, data protection, and incident response.

There is an additional set of themes that extend the core set to provide a mature set of organisational security capabilities. The additional themes are resilience, compliance validation, secure continuous integration / continuous deployment, configuration and vulnerability analysis, and security.

Specialist cybersecurity expertise is required to understand and model the right environment for security, risk, and compliance in the virtual data centre and integrate this into the organisation.



## Migration pilot / experience

Through the mobilisation phase of a migration, demonstrating the abilities of new organisational capabilities (such as cloud security, engineering, and operations) build confidence in the changes taking place. The teams involved gain valuable experience and expertise that can be codified and shared. Using and communicating this knowledge is a foundation to work successfully at scale.

Based on common application patterns as evidenced in the applications portfolio, it is possible to trial a migration of common application patterns.

For example, re-hosting a Microsoft Windows Server based application using CloudEndure. Another option is to re-platform an application, by replacing a database component, such as Microsoft SQL Server, to use Amazon RDS.

Choosing the right applications to pilot in the experience building exercise is important to ensure the teams build confidence in successful migrations. The first migrations should be based on common patterns in the applications portfolio.



## Case study

# SAP application architectures:

# Tambla Business Services

Tambla Business Services faced the harrowing prospect of vacating their primary data centre during the COVID-19 pandemic in 2020–2021. At that time, the business provided payroll services for roughly 10,000 people in both local health authorities throughout the Australia state of Victoria, as well as payroll services for some other large Australian organisations.



Tambla Business Services (TBS) reached out to Datacom cloud platform services (CPS) to lead a cloud migration to AWS. Leveraging Datacom’s strong partnership with AWS, CPS reached out for expert advice on modernising SAP application architectures.

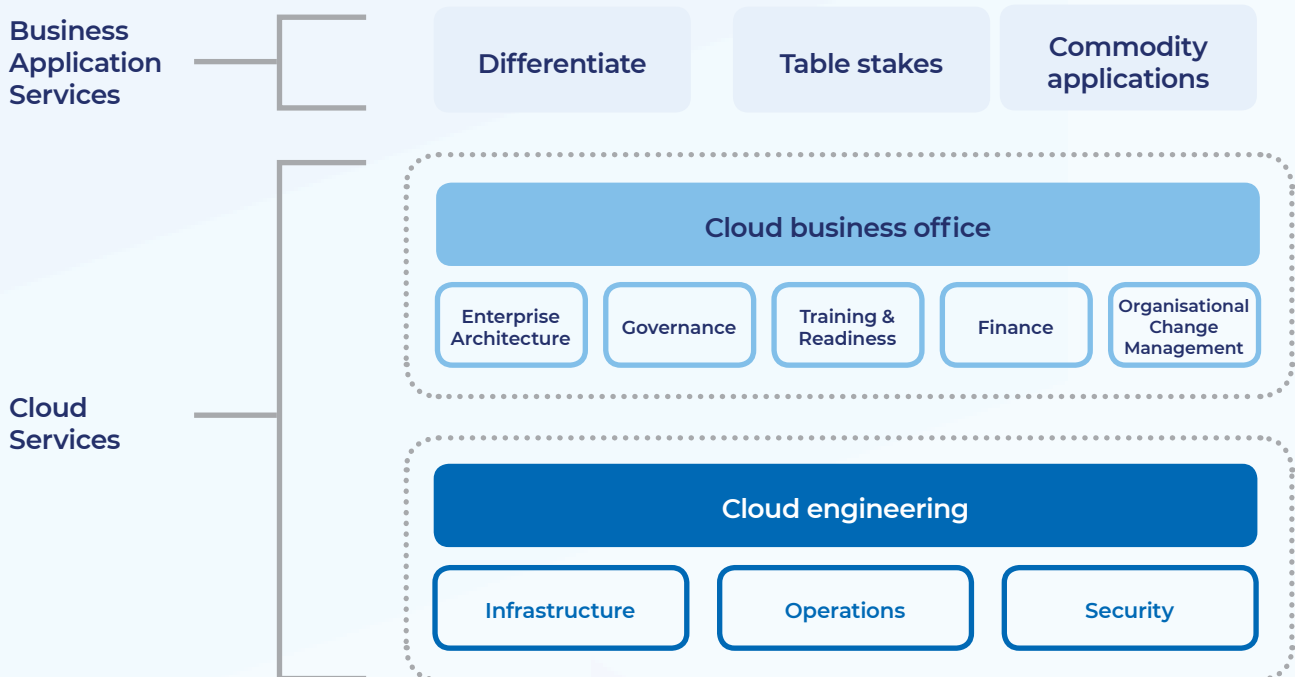
Together TBS, CPS, and AWS worked on a pilot with a customer to run a migrated ECC system in AWS with the following results:

- Selected jobs showed a percentage decrease in run time of roughly 53 per cent between onpremises run times and run times in AWS
- Full pay runs saw improvements with performance decreases observed of between 67 per cent and 58 per cent

The strength of results from the migration pilot provided a green light to move forward with phase one of the migration to AWS. Learnings during the migration pilot, such as the critical impact of services provided by routing, web dispatch, email, and domain name services were instrumental in planning a successful migration.

## People, skills, and culture

Establish a dedicated cloud services organisation to drive cloud adoption, the migration of applications and to build the requisite skills and expertise to be successful. This organisation will support the cloud operating model, as covered earlier in this paper. It will establish operational processes, standardisation, automation, and governance.



## Functional organisation of a cloud centre of excellence (CCoE)<sup>9</sup>

Start with a small, informal team of people with a common interest and some experience in experimenting with cloud implementations. Let it build over time to a more structured approach that supports codification of best practices, methods, and governance. Using experience, case studies, and the developing body of knowledge, widely communicate the organisational benefits and value of cloud adoption. Form smaller teams, guided by the core cloud services organisation, that will build specialisms in the common application patterns for migration. Integrate feedback from the specialist teams into the cloud services organisation as a whole.

Some guiding principles for the cloud services organisation are to ensure diverse, crossfunctional representation, drive enablement, not command and control, use intentional and targeted organisational change management to change company culture and norms, and build company culture into everything you do.

The cloud services organisation will evolve over time from a small, informal group to a broader, more formal group of like-minded experts. The teams will build and share expertise across the group, creating a body of knowledge on how to migrate to and operate in the cloud efficiently and effectively.

<sup>9</sup> AWS Migration Whitepaper, March 2018, AWS Whitepapers & Guides, <https://d1.awsstatic.com/whitepapers/Migration/aws-migrationwhitepaper.pdf>

## Landing zone

The landing zone is the realisation of the public / hybrid cloud platform, designed during the planning phase using the platform perspective of the cloud adoption framework. This perspective looks into compute, network, storage, database, solution architecture, and application development capabilities to design an environment to meet the specific needs of the organisation.

The landing zone is an initial structure with pre-defined configurations for AWS accounts, networks, identity and billing frameworks, and optional customer-selectable packages. It forms the foundation for the migration of applications and will expand over time as new services are provisioned to meet organisational needs.

The account structure provides a multiaccount structure with a pre-configured security baseline that aligns to the cloud operating model. The security baseline includes logs for security and auditing purposes.

The network structure implements connectivity between AWS and on- premises networks and provides the foundational network configuration that supports network isolation and segmentation requirements.

The identity and billing frameworks provide federated user identity and access management and centralized cost management and reporting.

The customer-selectable packages provide a set of selectable packages to integrate AWSrelated logs into popular reporting tools, integrate with the AWS Service Catalog, and automate infrastructure.



## Case study

### Providing migration services:

# Victoria Land Registry Services



Victoria Land Registry Services (VLRS) is a case where Datacom were engaged to provide migration services, including an AWS landing zone, which was used to move applications from an on-premises environment to the cloud.

VLRS manages more than 3.6 million property titles and processes more than a million property transactions every year, from sales and mortgages to caveats. Any downtime or delays could cause VLRS' customers — commercial and residential — to lose time and money.

Datacom provided a secure and compliant cloud environment for the migration that has resulted in a secure system and an enviable uptime of 99.995 per cent.

## Migration plan

Bringing everything together is the migration plan, which forms the spearhead for driving the migration and delivering the organisational benefits in the business case.

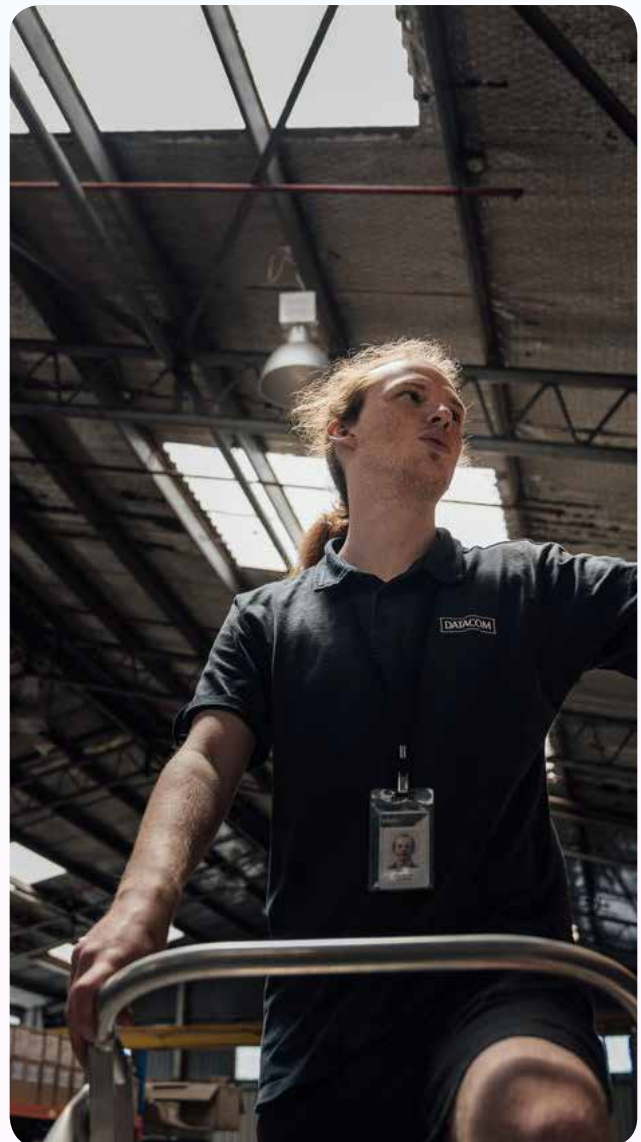
This includes managing scope, schedule, resource plan, issues and risks, co-ordination, and communication to stakeholders. It is recommended that agile delivery practices are utilised, amongst other things, as a standard best practice for cloud migration projects.

The technical planning required is another stream of work in migration planning and requires expertise from the enterprise solutions architecture capability of the cloud services organisation.

Architectural diagrams of applications to be migrated will be required to help inform decisions for transition architectures during application migrations.

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The amount of work should not be underestimated as the scale of the project will be apparent in the technical details. An agile, iterative process is a commonly adopted approach to help manage the scale.



# The AWS well-architected framework

## Overview

When planning migration to the cloud, how can you ensure a consistent approach to technical planning and design throughout the volume of work? This is where a cloud architecture framework comes into play. Founded on core organisational capabilities, it will ask how these are addressed with a view on common design principles and best practices.

The well-architected framework has been developed by AWS based on lessons learned from observing customers deploying systems into live environments, how well these systems perform, and the consequences of architectural trade-offs. AWS provide expert assistance to these customers in architecting the systems to take advantage of best practices in the cloud, prior to deployment. Based on the expert assistance in architecting systems for the cloud and the learnings in operational environments, the well-architected framework is distillation of many real-world use cases. It lays down a consistent approach for AWS customers and partners to evaluate architectures and implement designs that will scale over time. It helps cloud architects build secure, high-performing, resilient, and efficient infrastructure for their applications.

## Design principles

The well-architected framework identifies a set of general design principles to facilitate good design in the cloud:

- 1. Stop guessing your capacity needs**
- 2. Test systems at production scale**
- 3. Automate to make architectural experimentation easier**
- 4. Allow for evolutionary architect**
- 5. Drive architectures using data**
- 6. Improve through game days**

These design principles are described in further detail in the AWS well-architected framework white paper. The paper also provides information on the approach AWS takes to distribute architectural decision-making into delivery teams. This is a valuable take-away on how a demonstrably successful company running at scale enables teams to work at speed with a consistently high level of quality.



## Pillars

There are five pillars of the well-architected framework: operational excellence, security, reliability, performance efficiency, and cost optimisation. Each of the pillars has a white paper of its own that covers it in detail. Below is a summary of each pillar.

### Operational excellence

Operational excellence considers the ability to run and monitor systems to deliver business value and to continually improve supporting processes and procedures. The design principles of the operational excellence pillar are perform operations as code, annotate documentation, make frequent, small, reversible changes, refine operations procedures frequently, anticipate failure, and learn from all operational failures. There are three best practice areas for operational excellence in the cloud: prepare, operate, and evolve.

### Security

Security takes into account the ability to protect information systems, and assets while delivering business value through risk assessments and mitigation strategies. The design principles of the security pillar are implement a strong identity foundation, enable traceability, apply security at all layers, automate security best practices, protect data in transit and at rest, keep people away from data, and prepare for security events. There are five best practice areas for security in the cloud: identity and access management, detective controls, infrastructure protection, data protection, and incident response

### Reliability

Reliability includes the ability of a system to recover from infrastructure or service disruptions, dynamically acquire computing resources to meet demand, and mitigate disruptions such as misconfigurations or transient network issues. The design principles of the reliability pillar are test recovery procedures, automatically recover from failure, scale horizontally to increase aggregate system availability, stop guessing capacity, and manage change in automation. There are three best practice areas for reliability in the cloud: foundations, change management, and failure management.

### Performance efficiency

Performance efficiency considers the ability to use computing resources efficiently to meet system requirements, and to maintain that efficiency as demand changes and technologies evolve. The design principles of the performance efficiency pillar are democratise advanced technologies, go global in minutes, use serverless architectures, experiment more often, and mechanical sympathy. There are four best practice areas for performance efficiency in the cloud: selection, review, monitoring, and trade-offs.

### Cost optimisation

Cost optimisation includes the ability to run systems to deliver business value at the lowest price point. The design principles of the cost optimisation pillar are adopt a consumption model, measure overall efficiency, stop sending money on data centre operations, analyse and attribute expenditure, and use managed and application-level services to reduce cost of ownership. There are four best practices for cost optimisation in the cloud: expenditure awareness, cost-effective resources, matching supply and demand, and optimising over time.

### Lenses

Lenses are an extension of the guidance offered by the AWS well-architected design principles and pillars. Well-architected lenses extend to specific industry and technology domains, such as machine learning, analytics, serverless, high performance computing (HPC), Internet of Things (IoT), and financial services. Specific lenses can be used to perform a thorough evaluation of workloads for migration when migration strategies and approaches have been determined and applied to the application portfolio. For example, where applications have been selected for migration into a serverless architecture use the serverless lens.

**Summary** Using the well-architected framework provides a basis for consistent evaluation of architectural designs for the cloud, based on best practice developed through real-world use cases. Use a framework such as this to ensure a migration standardised on common design principles and best practices is planned for and takes place.

# Migration at scale

(migrate and modernise)

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With some early success at migrations during the planning phase, the cloud services organisation has built some experience and now it is time to scale. The core teams expand to form migration sprint teams that operate in parallel. This is useful for re-host and re-platforming patterns that can use automation and tooling to accelerate application migration.

## Codifying experience

The teams will work through the same six step process for each application they migrate: discover, design, build, integrate, validate and cutover. Some patterns are more automatable than others, such as re-hosting, which has a number of methods and tools available.

## Discovery

The discovery step analyses current and future architectures, fills gaps in information as needed to support decision making (such as operation runbooks, connectivity, data flow), and a migration plan for the application is agreed with the sprint team and the application owner.

## Design

The design step develops and documents the target state, including AWS architecture, application architecture, and supporting operational components and processes. A member of the sprint team and the engineering team design the application for the targeted AWS environment, using information from the discovery step. Infrastructure architecture is considered here to provide an outline of what services to use.

## Build

The build step is where the migration team joins with required people, tools, and reusable templates to execute the migration plan. The team will use pre-defined methods and tools to follow standard migration patterns, where possible.

## Integrate

The integrate step is where the migration team works with external service providers and consumers of the application to make external connections or service calls to the application. The team then run the application to demonstrate functionality and operation before the application is ready for validation.

## Validate

The validate step is where the application is tested to validate it has been successfully migrated and is ready for cutover. Tests may include verification, functional, performance, disaster recovery, etc. The migration teams will evaluate release management, verify rollout and rollback plans and evaluate performance baselines. Business acceptance is prepared for cutover.

## Cutover

The cutover step is the ultimate step where the cutover plan previously agreed with application owner is executed. A user acceptance test here supports a successful cutover.

## Core cloud services teams

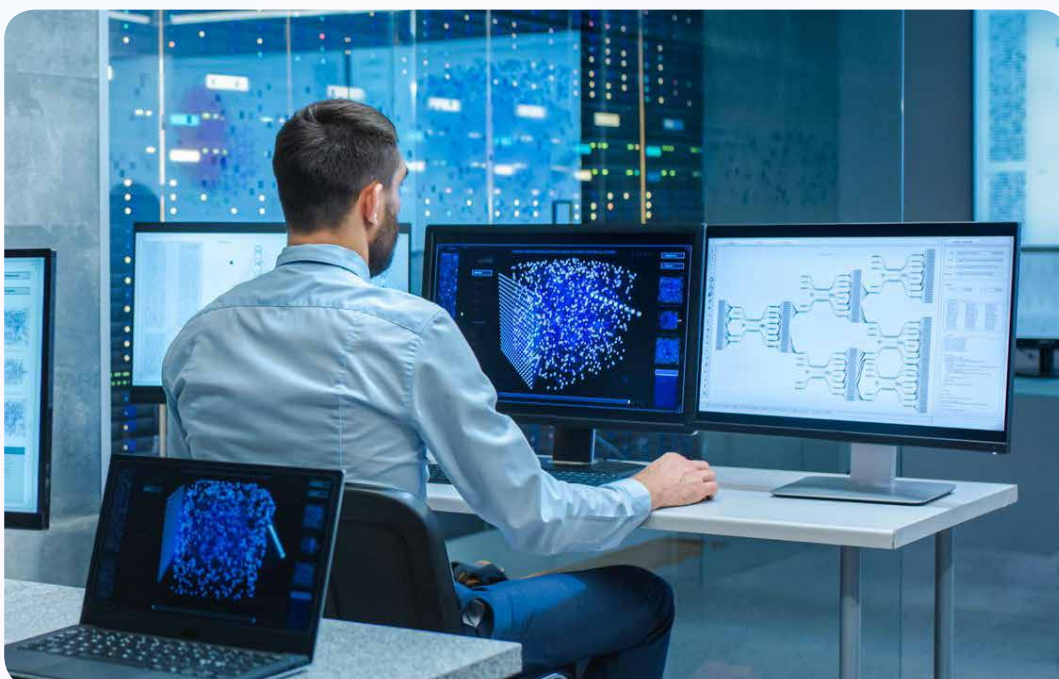
Whilst migration teams may form and disassemble to support the overall migration effort, core services teams will form the backbone throughout. They are a part of the new IT operating model and will have their own areas of expertise. The core cloud teams work across the migration teams, acting as a central hub for managing projects, sharing lessons learned, coordinating resources, and building common solutions.

## Research and innovation

This team develops repeatable solutions that will expedite migrations in coordination with the engineering and migration teams. They work on larger or more complex technical issues for the migration teams.

## Portfolio discovery and planning

The portfolio discovery and planning team accelerates activities through refining the application portfolio, running discovery processes, and optimising application backlogs. They work to eliminate objections and minimise wasted effort. These core teams build a centre of excellence that will spread knowledge and expertise throughout the migration teams, whilst managing resources and communications through to coordinating the overall migration effort.



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# Further reading

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