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# AWS Prescriptive Guidance

## **Mobilize your organization to accelerate large-scale migrations**



## **AWS Prescriptive Guidance: Mobilize your organization to accelerate large-scale migrations**

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# Mobilize your organization to accelerate large-scale migrations

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*August 2019 (last update (p. 27): June 2022)*

Migrating hundreds or thousands of workloads requires coordination and implementation across multiple disciplines and teams. AWS approaches large-scale migrations in three phases: assess, mobilize, and migrate. Each phase builds on the previous one. This AWS Prescriptive Guidance strategy covers the assess phase and the mobilize phase. These phases set the foundation for accelerated migration at scale during the migrations phase.

This migration strategy includes methods and best practices for the following:

- Mobilizing your workforce and resources
- Establishing automation to migrate applications with an agile approach
- Migrating these assets to the AWS Cloud

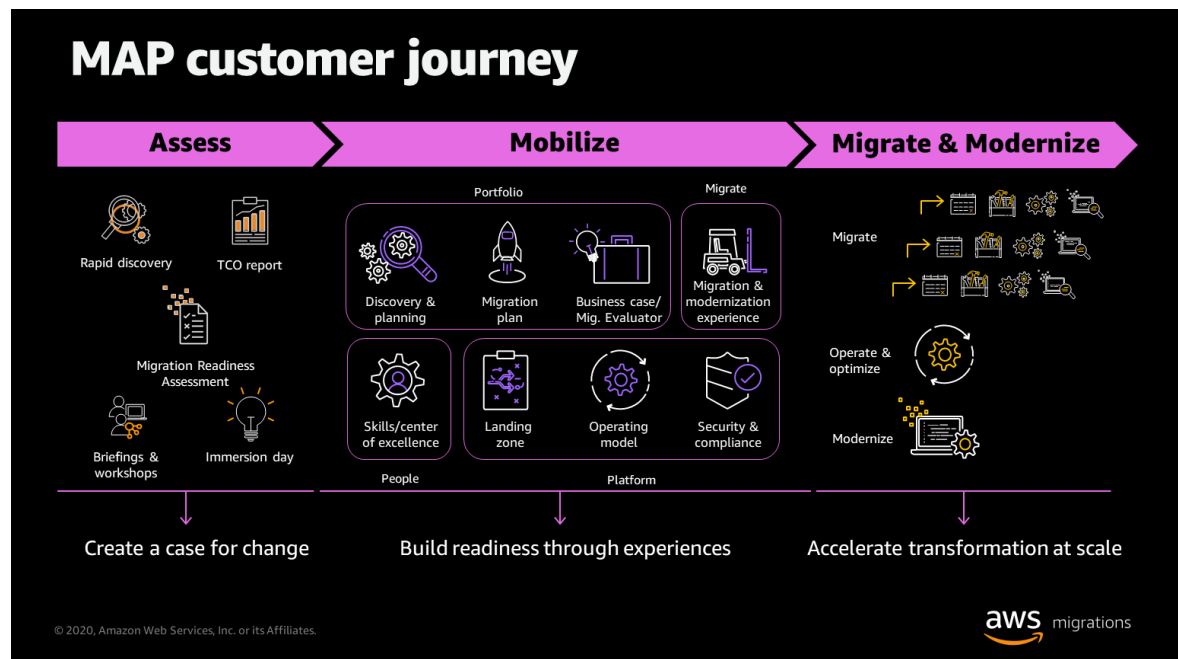
This approach is based on the AWS Professional Services team's years of experience helping enterprise AWS customers mobilize for cloud adoption and migration.

This strategy is for anyone planning to migrate their on-premises workloads to the AWS Cloud: IT and business executives, program and project managers, product owners, and operations and infrastructure managers. It discusses how you can accelerate your cloud adoption, create a migration plan, set up a foundation through hands-on experience, and migrate your first set of applications to the AWS Cloud in weeks.

# Overview

To optimize your cloud adoption and migration, you must first assess and evaluate your enterprise for readiness. After you assess the readiness of your organization, you can accelerate your cloud adoption and establish a foundation for migration at scale through the hands-on experience of migrating a first wave of applications in just a few weeks. We discuss these phases in more detail in the following topics.

The iterative approach to cloud adoption discussed in this guide can be broken out into the three high-level phases of assess, mobilize, and migrate. These phases are shown in the following diagram.



## Assess

The first phase of a cloud migration begins with a cloud readiness assessment of your enterprise's current state. These assessment tasks give you a clear picture of what you will migrate, as well as a business case for migration and total cost of ownership (TCO) analysis for migration.

A Migration Readiness Assessment (MRA) is a process that provides you with the following:

- An understanding about how far along your enterprise is in the cloud journey
- An understanding of your current strengths and weaknesses in relation to a cloud-ready enterprise
- An action plan to close identified gaps

This assessment is based on the AWS Cloud Adoption Framework (AWS CAF) and its six perspectives: business, people, governance, platform, security, and operations. Using this framework during the assessment phase helps ensure that you have a holistic view of the transformation initiative that will support an effective move to the cloud.

The assess phase includes a rapid discovery process with high-level TCO assessment in addition to the MRA. These steps will be useful as you progress towards obtaining stakeholder commitment and funding for the larger initiatives that follow.

For more information, see [Assess phase \(p. 5\)](#).

## Mobilize

With a strong understanding of your current state and your portfolio along with the solid business case, you develop in the assessment phase, you can demonstrate the value of the cloud to your organization.

The goal of the mobilize phase is to build foundational capability both in the organization and with the AWS environment with hands-on migration experience focused on security and operations automation. This process brings together your portfolio of tools and practices in a scalable and secure AWS landing zone. In this phase, you migrate a small set of business applications to the cloud, while enforcing an agile and scalable delivery culture, team structure, and change management process.

The AWS mobilize approach includes a defined set of activities across eight distinct workstreams:

- Detailed business case
- Detailed portfolio discovery
- Application migration
- Migration governance
- AWS landing zone
- Security, risk, and compliance
- Operations
- People: skills, culture, change, and leadership

With this approach, activities under these workstreams are delivered across eight two-week sprints.

Mobilize delivers the following outcomes:

- Improve your IT staff's skill and competency for migration and organizational transformation by building confidence with methodology, processes, and tooling
- Define and automate security, risk, and compliance policies to accommodate operational controls
- Define and implement an AWS landing zone that can scale as you migrate additional applications
- Establish your cloud operating model
- Run applications in production capacity

Migration during the mobilize phase is an iterative process that evolves as your organization develops new skills, tools, and capabilities. These skills and capabilities build momentum and accelerate your migration efforts over time. Establishing the right foundation to build on is key to a successful migration. The AWS migration framework balances the business and technical efforts needed to complete a cloud migration. This model helps you identify key business drivers for migration and the best strategies for planning and implementing a successful cloud migration.

For more information, see [Mobilize phase \(p. 6\)](#).

## Migrate

The migrate phase uses the patterns, processes, tools, resources, and methodology defined and tested during the mobilize phase to migrate applications at scale. After using the best practices and lessons learned from the earlier phases, you can implement a migration factory, a blueprint of scaling implementation and operations, through automation and agile delivery.

For more information, see [Migrate phase \(p. 14\)](#).



# Assess phase

In order to mobilize your workforce and resources to migrate your enterprise at scale, you must first assess your readiness and inventory your portfolio. These steps enable you to build a business case with right key performance indicators (KPIs) and metrics and to align key stakeholders and leadership on business goals. You will run the Migration Readiness Assessment (MRA) workstream during this phase.

## Migration Readiness Assessment (MRA)

MRA is an AWS process of gaining insights about your enterprise's current cloud readiness and building an action plan to close identified gaps, using the AWS Cloud Adoption Framework (AWS CAF).

### Objective

- Assess and evaluate your enterprise's readiness by answering questions based on the six AWS CAF perspectives

### Outcomes

- Understanding where your enterprise is in your cloud journey
- Identification of areas of strength and weakness
- Plan to fill the identified gaps

### How-to guide

[Evaluating migration readiness](#)

# Mobilize phase

The next step in preparing your workforce and resources to migrate your enterprise at scale is to break down the mobilize activities into different workstreams. Although the goal of the mobilize phase is the migration of business applications, this phase also provides an opportunity to lay the foundation for tooling, process, and culture that will accelerate your migration at scale. Most of these workstreams can run in parallel after the assessment phase is complete. The following workstreams should be run during this phase:

- [Detailed business case \(p. 6\)](#)
- [Detailed portfolio discovery \(p. 6\)](#)
- [Application migration \(p. 7\)](#)
- [Migration governance \(p. 8\)](#)
- [Landing zone \(p. 9\)](#)
- [Security, risk, and compliance \(p. 10\)](#)
- [Operations \(p. 11\)](#)
- [People: skills, culture, change, and leadership \(p. 12\)](#)

These are discussed in detail in the following sections.

## Detailed business case

A detailed, multi-year business migration case that includes current on-premises costs, new AWS costs, and migration costs helps align stakeholders and executives.

### Objectives

- Determine migration costs
- Estimate how much you can save by migrating to AWS
- Estimate other business benefits of migrating
- Determine the length of the target migration
- Determine which workloads you will migrate and in which year
- Input the detailed inventory for each workload

### Outcomes

- Multi-year migration business case
- Migration costs

AWS Partners such as RISC Networks, Deloitte, Cloudamize, and Apptio have tools and experience in this area.

## Detailed portfolio discovery

This is where you start to pull the pieces together and develop a strategy for migration. At this stage, you want to consider where your cloud journey fits into your organization's larger business strategy and find

opportunities for alignment of vision. A well-aligned migration strategy with a supporting business case and a thorough application migration plan sets the proper groundwork for cloud adoption success.

A critical aspect of your migration strategy is the collection of application portfolio data and rationalization of this data against the seven Rs of migration: rehost, replatform, refactor/re-architect, repurchase, relocate, retire, and retain. You build a migration wave plan by using the seven Rs to categorize what is in your environment. Next, blend those categories with information about interdependencies, technical complexity to migrate, and how you will migrate each application or set of applications. After you analyze your applications according to the seven Rs, you can outline a migration plan for each application in your portfolio. This is an iterative plan that will mature as you progress through the migration, build confidence, learn new capabilities, and better understand your existing estate.

## Objectives

- Develop a prioritized list of migration groups, including applications and associated infrastructure, for all in-scope applications
- Define the necessary business and infrastructure data elements, and recommend data collection tools
- Work with business and IT leadership teams to define migration drivers and ultimately the portfolio plan
- Create a high-fidelity migration plan for the application portfolio that includes the following activities:
  - Discover current state environment, including all applications and supporting infrastructure
  - Determine application and infrastructure dependencies
  - Document application criticality, life cycle, and business cycle
  - Group applications and infrastructure into migration groups and patterns
  - Determine migration readiness and suitability, target state design, and migration pattern
  - Develop prioritized migration schedule

## Outcomes

- High-fidelity, prioritized migration schedule for initial four migration sprints
- Application and infrastructure data sufficient to group and schedule entire application portfolio

## AWS partners and tools

If you need help understanding your IT portfolio, you can work with partners like RISC Networks, Cloudamize, and Deloitte, and you can use the [AWS Application Discovery Service](#).

## How-to guide

- [Portfolio discovery and analysis](#)

# Application migration

The application migration workstream integrates outputs from other workstreams with the migration of production applications to the AWS Cloud. This workstream guides your resources and leads you through application migration challenges, best practices, agile frameworks, tools, and processes that can be successfully applied to any large-scale migration effort.

## Objectives

Migrate business applications from on premises to the AWS Cloud:

- Define how to select and prioritize applications for migrations
- Understand proven best practices to migrate applications to AWS
- Validate your AWS landing zone, operations runbook, and security playbook by testing applications on AWS
- Train internal staff on AWS services and partner tools through hands-on experience
- Learn industry-accepted migration tools and techniques for different application types
- Get a head start by using existing epics (backlogs) from different [migration patterns](#)

## Outcomes

- Validate different components of the AWS landing zone through application deployment and testing
- Validate the outlined operating model (an output of the operations workstream) by deploying, monitoring, and reporting on applications running on the AWS Cloud
- Learn scalable agile process and migration patterns for migrating different applications
- Learn how to design target architectures and how to use data migration, server migration, and vendor tools for automated migration
- Train resources on AWS services, and provide hands-on migration experience
- Validate your security playbook through a real-time audit of applications running on AWS
- Learn, implement, and validate a migration delivery process, including number of resources, velocity (speed of migration), quality assurance, release management, and integration with managed service providers (MSPs)

## AWS partners and tools

When you have some foundational experience migrating a few applications and a plan in place that the organization supports, it's time to accelerate the migration and achieve scale. Migration Delivery Partners, such as 2nd Watch and Accenture, can help you through every stage of migration. Migration Marketplace Partners such as RiverMeadow Software and Attunity can also help, and you can use tools and services such as [AWS Server Migration Service \(AWS SMS\)](#) and [AWS Database Migration Service \(AWS DMS\)](#). For a full list of all migration partners and solutions, see the [Migration Partner Solutions](#) website.

## How-to guide

- [A tools catalog for accelerating migration with automation](#)

## Migration governance

The migration governance workstream includes managing migration scope, schedule, resource plan, issues and risks, and communication to all stakeholders. Multiple applications are migrated in multiple streams, impacting multiple teams, so an early focus on planning can help organize the project. The migration plan considers critical factors such as the order in which workloads will migrate, when resources are needed, and how the progress of the migration will be tracked. We recommend agile delivery methodologies, project control best practices, a robust business communication plan, and a well-defined delivery approach.

## Objectives

Manage the scope, schedule, resource plan, issues and risks, coordination and communication to all stakeholders:

- Set up scrum teams comprised of internal resources from workstreams defined in this phase
- Identify 10 to 30 applications to migrate from on premises to AWS
- Review your current-state project management methods and capabilities
- Define project management agile methods and tools that will be used during the project
- Identify high-level teams for each workstream
- Define the project charter, reporting, and escalation procedures
- Facilitate the coordination and activities of groups across the project

## Outcomes

- Set up an agile program with epics for all workstreams in the readiness and planning phase
- Provide considerations and migration implementation plans for discovery, transformation, and deployment of complex sets of workload components

## AWS Partners

AWS Migration Competency Partners can help you through every stage of migration, accelerating results by providing personnel, tools, and education in the form of professional services. These partners are either [managed service providers \(MSPs\)](#) or have a relationship with an AWS-audited MSP to help customers with ongoing support of AWS workloads. To learn more about AWS Migration Competency Partners, see [Migration Partner Solutions](#).

## How-to guide

- [Setting up an agile program to accelerate cloud migrations](#)

## Landing zone

A landing zone is a well-architected, multi-account AWS environment that is a starting point from which you can deploy workloads and applications. It provides a baseline to get started with multi-account architecture, identity and access management, governance, data security, network design, and logging.

AWS has two options for creating your landing zone: a service-based landing zone using [AWS Control Tower](#) and a customized landing zone that you build. Each option requires a different level of AWS knowledge.

AWS created Control Tower to help you save time by automating the setup of a landing zone so you can run secure and scalable workloads. Control Tower is managed by AWS and uses best practices and guidelines to help you create your foundational environment. Control Tower uses integrated services like [AWS Service Catalog](#) and [AWS Organizations](#) to provision accounts in your landing zone and manage access to those accounts.

## Objectives

Create a landing zone with an initial configuration for the following:

- Account structure
- Network structure
- Predefined identity and billing frameworks
- Predefined user-selectable packages
- Ability to customize and configure

## Outcomes

- A defined and secure landing zone ready for migration and further customization

## How-to guide

- [Setting up a secure and scalable multi-account AWS environment](#)

## Related resources

- [AWS Control Tower](#)
- [AWS Service Catalog](#)
- [AWS Organizations](#)
- [Architecting security & governance across your landing zone](#)

# Security, risk, and compliance

The security, risk, and compliance workstream defines a structured approach to help you build confidence in AWS. It also enables foundational security, risk, and compliance capabilities that can accelerate your readiness and planning for a migration project. The delivery approach is built on the AWS CAF security perspective and provides more detailed guidance for security teams who are preparing for a migration of business workloads to AWS. This workstream leverages the concept of a virtual data center to address minimum baseline security and compliance controls. The virtual data center is intended to be constructed through an agile development process using one or more cloud security delivery teams.

## Objectives

The security perspective provides a recommended initial configuration for the following:

- AWS Identity and Access Management (IAM) model
- Logging and monitoring model
- Infrastructure security
- Data protection
- Incident response

## Outcomes

Develop referenceable playbooks that are supported by relevant code examples and that cover the following five core topics for security and audit tasks utilizing AWS services:

- Identity and access management

- Detective controls
- Infrastructure security
- Data protection
- Incident response

## How-to guide

- [Assessing and building a security foundation for cloud mobilization](#)

# Operations

The objective of the operations workstream is to review your current operational model and develop an operations integration approach to support future-state operating models as you migrate to AWS. The operating model should encompass the relationships among people, processes, and tools to support the delivery of organizational objectives. Workstream owners identify and document high-level gaps based on the end-state operational model for tools, processes, and people. A roadmap prioritization is then created for implementation. This roadmap is influenced by, and will influence, the other migration workstreams because of the many interdependencies among security, people, AWS landing zone, and other project workstreams.

## Objectives

Create a roadmap for operational constructs to scale on AWS:

- Identify the desired IT service management (ITSM) state and support model
- Review current operational practices (tools, people, processes) on premises and in the cloud
- Identify potential vulnerabilities around scaling operations
- Review business continuity planning (BCP), and create a plan to address any potential impact on operations
- Identify how running the migration will impact normal operations
- Identify operational support organizations and partners who will interact with the cloud environments

## Outcomes

- Improved operational posture, and enhanced service-level agreements (SLAs) and operational-level agreements (OLAs)
- Runbooks and design guides for operational silos such as backups, monitoring, and deployments
- Operational playbook on AWS
- Business continuity planning/disaster recovery (BCP/DR) playbook
- ITSM on AWS documented and defined

## AWS Partners and tools

As applications are migrated and old systems are retired, your operating model becomes an evergreen set of people, processes, and technology that constantly iterates toward a modern operating model. AWS Partners such as AppDynamics, New Relic, and Dynatrace can help you continue to iterate on your operating model as you move more operations to the cloud.

## How-to guide

- [Modernizing operations in the AWS Cloud](#)

# People: skills, culture, change, and leadership

This workstream is critical to establishing migration readiness and running a migration at scale. The impact of a cloud migration will be felt across an entire organization and will significantly affect the organizational culture. Additionally, your organizational culture will impact your journey to the cloud. These cultural implications, your organization's receptivity to change, prior change successes and failures, organizational communication patterns, organizational structure, and existing employee training and enablement strategies are all important elements of building a successful approach to migration. To be prepared for an enterprise migration, you must have a critical mass of people with production AWS experience, established operational processes. You must also have a Cloud Center of Excellence (CCoE) dedicated to mobilizing the appropriate resources and leading the organization through the many organizational and business transformation challenges presented over the course of a large-scale migration effort.

## Objectives

- Design the teams responsible for mobilizing critical cloud resources
- Define how the organization builds and implements their cloud strategy by designing teams for the future state of operations
- Establish a dedicated team with single-threaded ownership and strong, visible, engaged executive sponsorship
- Set functional areas to be managed throughout the migration journey
- Start to establish a cloud governance model, set of standards, best practices, and guiding principles or tenets
- Use the AWS OCM 6-Point Framework and Essentials Toolkit, which provides a comprehensive kit of enablement tools to support your cloud adoption journey

## Outcomes

- Change management risk document
- Identification of high-level change impacts (by role and by major process)
- Mapping of key stakeholders
- Communication messaging strategy and platform
- Initial communication plan and messaging matrix
- Change management work plan (initial)
- Organizational acceleration charter
- People adoption/acceleration team structure (documented and onboarded)
- Definition of organizational acceleration goals and objectives
- Future state staffing model (target organization structure)
- Change risk scorecard (risk management)
- Leadership alignment document
- Stakeholder report cadence (stakeholder assessment)
- Change area impact analysis, stakeholder-based assessment, and change impact findings and mitigation recommendations



- Organizational readiness assessment report
- Change strategy
- Communication strategy
- Engagement strategy
- Training strategy
- Risk mitigation strategy
- Change acceleration sponsorship roadmap

## How-to guide

- [Accelerating cloud adoption through culture, change, and leadership](#)

# Migrate phase

Migrations at scale consist of the building blocks, processes, tools, resources, and methodology defined and tested during the readiness and planning phase. After using the best practices and lessons learned from the earlier phases, you can implement a migration factory, a blueprint of scaling implementation and operations, through automation and agile delivery.

## Migration factory

In the scale-out phase of the migration project, you will have multiple teams operating concurrently. Some will support a large volume of migrations in the rehost and minor replatform patterns. These teams are referred to as a migration factory. Your migration factory will increase the speed of your migration plan, with multiple sprint teams working in parallel. 20-50 percent of an enterprise application portfolio consists of repeated patterns that can be optimized by a factory approach. This is an agile delivery model, and it is important to create a release management plan. Your plan should be based on current workloads and information generated during the readiness and planning phase. It should be continually optimized for future migration waves and future migration teams. We recommend that you have a backlog of applications that support three sprints for each team. This allows you to re-prioritize applications if you have problems that affect the schedule.

Larger and more complex applications often follow the refactor/rearchitect pattern. They are generally conducted in planned release cycles by the application owner. The factory teams are self-sufficient and include five to six cross-functional roles. They include operations, business analysts and owners, migration engineers, developers, and DevOps professionals. The following are examples of specifically focused migration factory teams:

- Rehost migration teams migrate high-volume, low-complexity applications that don't require material change. These teams leverage migration automation tools. This approach is integrated into patch-and-release management processes.
- Replatform migration teams design and migrate applications that require a change of platform or a repeatable change in application architecture.
- Refactor/re-architect migration team(s) design and migrate complex or core business applications that have many dependencies. In most cases, development and technical operations teams support this business capability. The migration becomes a release cycle or a few release cycles within the plan for that team. There can be many of these in flight, and the Cloud Business Office (CBO) is responsible for tracking timing, risks, and issues through the completion of the migration. This team owns the application migration process.

Items to consider:

- Perform a portfolio analysis to understand common patterns across all applications to help build repeatable work for the factory teams to implement efficiently.
- Use an AWS Partner to help with resource constraints as your team supports regular business activities. AWS and the AWS Partner community can bring specialized resources for specific topics such as databases, application development, and migration tooling.

## How-to guide

- [Automating large-scale server migrations with Cloud Migration Factory](#)

## Next steps

In this strategy document, we introduced the preparation and implementation steps required for large migrations to the AWS Cloud. Analyzing your current state, building a plan, and iterating the work breaks a large migration into manageable activities for efficient implementation. Looking at a migration as an organizational change project empowers you to build buy-in and maintain communications through each stage of the process. Build a business case and refine the return on investment as the project progresses. Use the AWS Cloud Adoption Framework (AWS CAF) to analyze your environment through the different perspectives of business, people, governance, platform, security, and operations. This analysis gives you a complete view of which areas need improvement before you move forward with a large migration effort. Use a migration factory construct and iterate on migration patterns to create an optimal move to the AWS Cloud. Today, AWS customers have shifted from asking, "Why migrate to the cloud?" to asking, "When?" Building an effective migration strategy and plan will allow you to respond, "Now!"

Migration is just the beginning of what is possible. After you migrate an application, you can consider your migration experience as a capability that you can use for the optimization phases for this application. You will have a current architecture and a future design. You will implement, test, and validate changes. You will cut over and go live. You now have a new IT capability that can drive speed, agility, and business value for your organization and your company.

# Guides

The following guides provide more information about the technical and non-technical aspects of accelerating your migration to the cloud at scale.

- [Evaluating migration readiness](#)
- [Portfolio discovery and analysis for migration](#)
- [A tools catalog for accelerating migration with automation](#)
- [Setting up an agile program to accelerate cloud migrations](#)
- [Setting up a secure and scalable multi-account AWS environment](#)
- [Assessing and building a security foundation for cloud mobilization](#)
- [Modernizing operations in the cloud](#)
- [Accelerating cloud adoption through culture, change, and leadership](#)

# Patterns

AWS Prescriptive Guidance patterns provide tools, architectures, and step-by-step guidance for implementing the methodologies for the migration strategy. You'll also find patterns that support other initiatives, such as cloud-native or security projects. You can [view all patterns](#) on the AWS Prescriptive Guidance website, use the filtering options, or type in a search query to find patterns of interest.

# Resources

- [Migrating to Amazon Web Services](#)
- [Migrating to AWS: Best Practices and Strategies](#)
- [AWS Migration Readiness Assessment \(MRA\) \(requires login\)](#)
- [AWS Migration Portfolio Assessment \(MPA\) \(requires login\)](#)
- [Cloud Adoption Readiness Tool \(CART\)](#)
- Stephen Orban on cloud migration:
  - [Considering a Mass Migration to the Cloud? \(blog post\)](#)
  - [A Process for Mass Migrations to the Cloud \(blog post\)](#)
  - [Cloud-Native or Lift-and-Shift? \(blog post\)](#)
  - [6 Strategies for Migrating Applications to the Cloud \(blog post\)](#)
  - [Yes, You Can Migrate Your Mainframe to the Cloud \(article on \*medium.com\*\)](#)
- [4 Reasons to Re-Consider Lift-and-Shift to the Cloud \(article by Joe Chung on \*medium.com\*\)](#)
- [Simplify Cloud Migration with AWS Server Migration Service \(presentation at AWS re:Invent, 2016\)](#)
- [Getting Started with AWS Database Migration Service \(presentation at the 2016 AWS Global Summit Series, Chicago\)](#)

# AWS Prescriptive Guidance glossary

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[AI and ML terms \(p. 19\)](#) | [Migration terms \(p. 20\)](#) | [Modernization terms \(p. 24\)](#)

## AI and ML terms

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The following are commonly used terms in artificial intelligence (AI) and machine learning (ML)-related strategies, guides, and patterns provided by AWS Prescriptive Guidance. To suggest entries, please use the **Provide feedback** link at the end of the glossary.

binary classification	A process that predicts a binary outcome (one of two possible classes). For example, your ML model might need to predict problems such as "Is this email spam or not spam?" or "Is this product a book or a car?"
classification	A categorization process that helps generate predictions. ML models for classification problems predict a discrete value. Discrete values are always distinct from one another. For example, a model might need to evaluate whether or not there is a car in an image.
data preprocessing	To transform raw data into a format that is easily parsed by your ML model. Preprocessing data can mean removing certain columns or rows and addressing missing, inconsistent, or duplicate values.
deep ensemble	To combine multiple deep learning models for prediction. You can use deep ensembles to obtain a more accurate prediction or for estimating uncertainty in predictions.
deep learning	An ML subfield that uses multiple layers of artificial neural networks to identify mapping between input data and target variables of interest.
exploratory data analysis (EDA)	The process of analyzing a dataset to understand its main characteristics. You collect or aggregate data and then perform initial investigations to find patterns, detect anomalies, and check assumptions. EDA is performed by calculating summary statistics and creating data visualizations.
features	The input data that you use to make a prediction. For example, in a manufacturing context, features could be images that are periodically captured from the manufacturing line.
feature importance	How significant a feature is for a model's predictions. This is usually expressed as a numerical score that can be calculated through various techniques, such as Shapley Additive Explanations (SHAP) and integrated gradients. For more information, see <a href="#">Machine learning model interpretability with AWS</a> .

feature transformation	To optimize data for the ML process, including enriching data with additional sources, scaling values, or extracting multiple sets of information from a single data field. This enables the ML model to benefit from the data. For example, if you break down the "2021-05-27 00:15:37" date into "2021", "May", "Thu", and "15", you can help the learning algorithm learn nuanced patterns associated with different data components.
interpretability	A characteristic of a machine learning model that describes the degree to which a human can understand how the model's predictions depend on its inputs. For more information, see <a href="#">Machine learning model interpretability with AWS</a> .
multiclass classification	A process that helps generate predictions for multiple classes (predicting one of more than two outcomes). For example, an ML model might ask "Is this product a book, car, or phone?" or "Which product category is most interesting to this customer?"
regression	An ML technique that predicts a numeric value. For example, to solve the problem of "What price will this house sell for?" an ML model could use a linear regression model to predict a house's sale price based on known facts about the house (for example, the square footage).
training	To provide data for your ML model to learn from. The training data must contain the correct answer. The learning algorithm finds patterns in the training data that map the input data attributes to the target (the answer that you want to predict). It outputs an ML model that captures these patterns. You can then use the ML model to make predictions on new data for which you don't know the target.
target variable	The value that you are trying to predict in supervised ML. This is also referred to as an <i>outcome variable</i> . For example, in a manufacturing setting the target variable could be a product defect.
tuning	To change aspects of your training process to improve the ML model's accuracy. For example, you can train the ML model by generating a labeling set, adding labels, and then repeating these steps several times under different settings to optimize the model.
uncertainty	A concept that refers to imprecise, incomplete, or unknown information that can undermine the reliability of predictive ML models. There are two types of uncertainty: <i>Epistemic uncertainty</i> is caused by limited, incomplete data, whereas <i>aleatoric uncertainty</i> is caused by the noise and randomness inherent in the data. For more information, see the <a href="#">Quantifying uncertainty in deep learning systems</a> guide.

## Migration terms

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The following are commonly used terms in migration-related strategies, guides, and patterns provided by AWS Prescriptive Guidance. To suggest entries, please use the **Provide feedback** link at the end of the glossary.

7 Rs	<p>Seven common migration strategies for moving applications to the cloud. These strategies build upon the 5 Rs that Gartner identified in 2011 and consist of the following:</p> <ul style="list-style-type: none"><li>• Refactor/re-architect – Move an application and modify its architecture by taking full advantage of cloud-native features to improve agility, performance, and scalability. This typically involves porting the operating system and database. Example: Migrate your on-premises Oracle database to the Amazon Aurora PostgreSQL-Compatible Edition.</li></ul>
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- Replatform (lift and reshape) – Move an application to the cloud, and introduce some level of optimization to take advantage of cloud capabilities. Example: Migrate your on-premises Oracle database to Amazon Relational Database Service (Amazon RDS) for Oracle in the AWS Cloud.
- Repurchase (drop and shop) – Switch to a different product, typically by moving from a traditional license to a SaaS model. Example: Migrate your customer relationship management (CRM) system to Salesforce.com.
- Rehost (lift and shift) – Move an application to the cloud without making any changes to take advantage of cloud capabilities. Example: Migrate your on-premises Oracle database to Oracle on an EC2 instance in the AWS Cloud.
- Relocate (hypervisor-level lift and shift) – Move infrastructure to the cloud without purchasing new hardware, rewriting applications, or modifying your existing operations. This migration scenario is specific to VMware Cloud on AWS, which supports virtual machine (VM) compatibility and workload portability between your on-premises environment and AWS. You can use the VMware Cloud Foundation technologies from your on-premises data centers when you migrate your infrastructure to VMware Cloud on AWS. Example: Relocate the hypervisor hosting your Oracle database to VMware Cloud on AWS.
- Retain (revisit) – Keep applications in your source environment. These might include applications that require major refactoring, and you want to postpone that work until a later time, and legacy applications that you want to retain, because there's no business justification for migrating them.
- Retire – Decommission or remove applications that are no longer needed in your source environment.

application portfolio

A collection of detailed information about each application used by an organization, including the cost to build and maintain the application, and its business value. This information is key to [the portfolio discovery and analysis process](#) and helps identify and prioritize the applications to be migrated, modernized, and optimized.

artificial intelligence operations (AIOps)

The process of using machine learning techniques to solve operational problems, reduce operational incidents and human intervention, and increase service quality. For more information about how AIOps is used in the AWS migration strategy, see the [operations integration guide](#).

AWS Cloud Adoption Framework (AWS CAF)

A framework of guidelines and best practices from AWS to help organizations develop an efficient and effective plan to move successfully to the cloud. AWS CAF organizes guidance into six focus areas called perspectives: business, people, governance, platform, security, and operations. The business, people, and governance perspectives focus on business skills and processes; the platform, security, and operations perspectives focus on technical skills and processes. For example, the people perspective targets stakeholders who handle human resources (HR), staffing functions, and people management. For this perspective, AWS CAF provides guidance for people development, training, and communications to help ready the organization for successful cloud adoption. For more information, see the [AWS CAF website](#) and the [AWS CAF whitepaper](#).

AWS landing zone

A landing zone is a well-architected, multi-account AWS environment that is scalable and secure. This is a starting point from which your organizations can quickly launch and deploy workloads and applications with confidence in their security and infrastructure environment. For more information about landing zones, see [Setting up a secure and scalable multi-account AWS environment](#).

AWS Workload Qualification Framework (AWS WQF)

A tool that evaluates database migration workloads, recommends migration strategies, and provides work estimates. AWS WQF is included with AWS Schema

	<p>Conversion Tool (AWS SCT). It analyzes database schemas and code objects, application code, dependencies, and performance characteristics, and provides assessment reports.</p>
business continuity planning (BCP)	<p>A plan that addresses the potential impact of a disruptive event, such as a large-scale migration, on operations and enables a business to resume operations quickly.</p>
Cloud Center of Excellence (CCoE)	<p>A multi-disciplinary team that drives cloud adoption efforts across an organization, including developing cloud best practices, mobilizing resources, establishing migration timelines, and leading the organization through large-scale transformations. For more information, see the <a href="#">CCoE posts</a> on the AWS Cloud Enterprise Strategy Blog.</p>
cloud stages of adoption	<p>The four phases that organizations typically go through when they migrate to the AWS Cloud:</p> <ul style="list-style-type: none"><li>• Project – Running a few cloud-related projects for proof of concept and learning purposes</li><li>• Foundation – Making foundational investments to scale your cloud adoption (e.g., creating a landing zone, defining a CCoE, establishing an operations model)</li><li>• Migration – Migrating individual applications</li><li>• Re-invention – Optimizing products and services, and innovating in the cloud</li></ul> <p>These stages were defined by Stephen Orban in the blog post <a href="#">The Journey Toward Cloud-First &amp; the Stages of Adoption</a> on the AWS Cloud Enterprise Strategy blog. For information about how they relate to the AWS migration strategy, see the <a href="#">migration readiness guide</a>.</p>
configuration management database (CMDB)	<p>A database that contains information about a company's hardware and software products, configurations, and inter-dependencies. You typically use data from a CMDB in the portfolio discovery and analysis stage of migration.</p>
epic	<p>In agile methodologies, functional categories that help organize and prioritize your work. Epics provide a high-level description of requirements and implementation tasks. For example, AWS CAF security epics include identity and access management, detective controls, infrastructure security, data protection, and incident response. For more information about epics in the AWS migration strategy, see the <a href="#">program implementation guide</a>.</p>
heterogeneous database migration	<p>Migrating your source database to a target database that uses a different database engine (for example, Oracle to Amazon Aurora). Heterogeneous migration is typically part of a re-architecting effort, and converting the schema can be a complex task. <a href="#">AWS provides AWS SCT</a> that helps with schema conversions.</p>
homogeneous database migration	<p>Migrating your source database to a target database that shares the same database engine (for example, Microsoft SQL Server to Amazon RDS for SQL Server). Homogeneous migration is typically part of a rehosting or replatforming effort. You can use native database utilities to migrate the schema.</p>
idle application	<p>An application that has an average CPU and memory usage between 5 and 20 percent over a period of 90 days. In a migration project, it is common to retire these applications or retain them on premises.</p>
IT information library (ITIL)	<p>A set of best practices for delivering IT services and aligning these services with business requirements. ITIL provides the foundation for ITSM.</p>

IT service management (ITSM)	Activities associated with designing, implementing, managing, and supporting IT services for an organization. For information about integrating cloud operations with ITSM tools, see the <a href="#">operations integration guide</a> .
large migration	A migration of 300 or more servers.
Migration Acceleration Program (MAP)	An AWS program that provides consulting support, training, and services to help organizations build a strong operational foundation for moving to the cloud, and to help offset the initial cost of migrations. MAP includes a migration methodology for executing legacy migrations in a methodical way and a set of tools to automate and accelerate common migration scenarios.
Migration Portfolio Assessment (MPA)	An online tool that provides information for validating the business case for migrating to the AWS Cloud. MPA provides detailed portfolio assessment (server right-sizing, pricing, TCO comparisons, migration cost analysis) as well as migration planning (application data analysis and data collection, application grouping, migration prioritization, and wave planning). The <a href="#">MPA tool</a> (requires login) is available free of charge to all AWS consultants and APN Partner consultants.
Migration Readiness Assessment (MRA)	The process of gaining insights about an organization's cloud readiness status, identifying strengths and weaknesses, and building an action plan to close identified gaps, using the AWS CAF. For more information, see the <a href="#">migration readiness guide</a> . MRA is the first phase of the <a href="#">AWS migration strategy</a> .
migration at scale	The process of moving the majority of the application portfolio to the cloud in waves, with more applications moved at a faster rate in each wave. This phase uses the best practices and lessons learned from the earlier phases to implement a <i>migration factory</i> of teams, tools, and processes to streamline the migration of workloads through automation and agile delivery. This is the third phase of the <a href="#">AWS migration strategy</a> .
migration factory	Cross-functional teams that streamline the migration of workloads through automated, agile approaches. Migration factory teams typically include operations, business analysts and owners, migration engineers, developers, and DevOps professionals working in sprints. Between 20 and 50 percent of an enterprise application portfolio consists of repeated patterns that can be optimized by a factory approach. For more information, see the <a href="#">discussion of migration factories</a> and the <a href="#">CloudEndure Migration Factory guide</a> in this content set.
migration metadata	The information about the application and server that is needed to complete the migration. Each migration pattern requires a different set of migration metadata. Examples of migration metadata include the target subnet, security group, and AWS account.
migration pattern	A repeatable migration task that details the migration strategy, the migration destination, and the migration application or service used. Example: Rehost migration to Amazon EC2 with AWS Application Migration Service.
migration strategy	The approach used to migrate a workload to the AWS Cloud. For more information, see the <a href="#">7 Rs (p. 20)</a> entry in this glossary and see <a href="#">Mobilize your organization to accelerate large-scale migrations</a> .
operational-level agreement (OLA)	An agreement that clarifies what functional IT groups promise to deliver to each other, to support a service-level agreement (SLA).
operations integration (OI)	The process of modernizing operations in the cloud, which involves readiness planning, automation, and integration. For more information, see the <a href="#">operations integration guide</a> .

organizational change management (OCM)	A framework for managing major, disruptive business transformations from a people, culture, and leadership perspective. OCM helps organizations prepare for, and transition to, new systems and strategies by accelerating change adoption, addressing transitional issues, and driving cultural and organizational changes. In the AWS migration strategy, this framework is called <i>people acceleration</i> , because of the speed of change required in cloud adoption projects. For more information, see the <a href="#">OCM guide</a> .
playbook	A set of predefined steps that capture the work associated with migrations, such as delivering core operations functions in the cloud. A playbook can take the form of scripts, automated runbooks, or a summary of processes or steps required to operate your modernized environment.
portfolio assessment	A process of discovering, analyzing, and prioritizing the application portfolio in order to plan the migration. For more information, see <a href="#">Evaluating migration readiness</a> .
responsible, accountable, consulted, informed (RACI) matrix	A matrix that defines and assigns roles and responsibilities in a project. For example, you can create a RACI to define security control ownership or to identify roles and responsibilities for specific tasks in a migration project.
runbook	A set of manual or automated procedures required to perform a specific task. These are typically built to streamline repetitive operations or procedures with high error rates.
service-level agreement (SLA)	An agreement that clarifies what an IT team promises to deliver to their customers, such as service uptime and performance.
task list	A tool that is used to track progress through a runbook. A task list contains an overview of the runbook and a list of general tasks to be completed. For each general task, it includes the estimated amount of time required, the owner, and the progress.
workstream	Functional groups in a migration project that are responsible for a specific set of tasks. Each workstream is independent but supports the other workstreams in the project. For example, the portfolio workstream is responsible for prioritizing applications, wave planning, and collecting migration metadata. The portfolio workstream delivers these assets to the migration workstream, which then migrates the servers and applications.
zombie application	An application that has an average CPU and memory usage below 5 percent. In a migration project, it is common to retire these applications.

## Modernization terms

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The following are commonly used terms in modernization-related strategies, guides, and patterns provided by AWS Prescriptive Guidance. To suggest entries, please use the **Provide feedback** link at the end of the glossary.

business capability	What a business does to generate value (for example, sales, customer service, or marketing). Microservices architectures and development decisions can be driven by business capabilities. For more information, see the <a href="#">Organized around business capabilities</a> section of the <a href="#">Running containerized microservices on AWS</a> whitepaper.
domain-driven design	An approach to developing a complex software system by connecting its components to evolving domains, or core business goals, that each component serves. This concept was introduced by Eric Evans in his book, <i>Domain-Driven Design: Tackling Complexity in the Heart of Software</i> (Boston: Addison-Wesley

	<p>Professional, 2003). For information about how you can use domain-driven design with the strangler fig pattern, see <a href="#">Modernizing legacy Microsoft ASP.NET (ASMX) web services incrementally by using containers and Amazon API Gateway</a>.</p>
microservice	<p>A small, independent service that communicates over well-defined APIs and is typically owned by small, self-contained teams. For example, an insurance system might include microservices that map to business capabilities, such as sales or marketing, or subdomains, such as purchasing, claims, or analytics. The benefits of microservices include agility, flexible scaling, easy deployment, reusable code, and resilience. For more information, see <a href="#">Integrating microservices by using AWS serverless services</a>.</p>
microservices architecture	<p>An approach to building an application with independent components that run each application process as a microservice. These microservices communicate through a well-defined interface by using lightweight APIs. Each microservice in this architecture can be updated, deployed, and scaled to meet demand for specific functions of an application. For more information, see <a href="#">Implementing microservices on AWS</a>.</p>
modernization	<p>Transforming an outdated (legacy or monolithic) application and its infrastructure into an agile, elastic, and highly available system in the cloud to reduce costs, gain efficiencies, and take advantage of innovations. For more information, see <a href="#">Strategy for modernizing applications in the AWS Cloud</a>.</p>
modernization readiness assessment	<p>An evaluation that helps determine the modernization readiness of an organization's applications; identifies benefits, risks, and dependencies; and determines how well the organization can support the future state of those applications. The outcome of the assessment is a blueprint of the target architecture, a roadmap that details development phases and milestones for the modernization process, and an action plan for addressing identified gaps. For more information, see <a href="#">Evaluating modernization readiness for applications in the AWS Cloud</a>.</p>
monolithic applications (monoliths)	<p>Applications that run as a single service with tightly coupled processes. Monolithic applications have several drawbacks. If one application feature experiences a spike in demand, the entire architecture must be scaled. Adding or improving a monolithic application's features also becomes more complex when the code base grows. To address these issues, you can use a microservices architecture. For more information, see <a href="#">Decomposing monoliths into microservices</a>.</p>
polyglot persistence	<p>Independently choosing a microservice's data storage technology based on data access patterns and other requirements. If your microservices have the same data storage technology, they can encounter implementation challenges or experience poor performance. Microservices are more easily implemented and achieve better performance and scalability if they use the data store best adapted to their requirements. For more information, see <a href="#">Enabling data persistence in microservices</a>.</p>
split-and-seed model	<p>A pattern for scaling and accelerating modernization projects. As new features and product releases are defined, the core team splits up to create new product teams. This helps scale your organization's capabilities and services, improves developer productivity, and supports rapid innovation. For more information, see <a href="#">Phased approach to modernizing applications in the AWS Cloud</a>.</p>
strangler fig pattern	<p>An approach to modernizing monolithic systems by incrementally rewriting and replacing system functionality until the legacy system can be decommissioned. This pattern uses the analogy of a fig vine that grows into an established tree and eventually overcomes and replaces its host. The pattern was <a href="#">introduced by Martin Fowler</a> as a way to manage risk when rewriting monolithic systems. For an</p>

two-pizza team

example of how to apply this pattern, see [Modernizing legacy Microsoft ASP.NET \(ASMX\) web services incrementally by using containers and Amazon API Gateway](#).

A small DevOps team that you can feed with two pizzas. A two-pizza team size ensures the best possible opportunity for collaboration in software development. For more information, see the [Two-pizza team](#) section of the [Introduction to DevOps on AWS](#) whitepaper.

# Document history

The following table describes significant changes to this document. If you want to be notified about future updates, you can subscribe to an [RSS feed](#).

update-history-change	update-history-description	update-history-date
<a href="#">Updated content (p. 27)</a>	Updated the objectives in the <a href="#">security, risk, and compliance workstream</a> .	June 20, 2022
<a href="#">Updated content (p. 27)</a>	Updated the content in the <a href="#">Mobilize phase</a> topic for additional clarity.	February 24, 2020
<a href="#">Initial publication (p. 27)</a>	—	August 5, 2019