CHAPTER 13

Migration and Transfer

Introduction

Migrating workloads, applications, and data to the cloud is critical for organizations seeking scalability, cost efficiency, and operational resilience. AWS provides migration and transfer services that enable businesses to transition from on-premises infrastructure to the cloud with minimal risk, downtime, and complexity. These services facilitate diverse migration scenarios, including infrastructure modernization, database replication, large-scale data transfers, and legacy system re-platforming [1], [2].

Historically, cloud migrations were primarily manual, time-consuming, and fraught with operational risks. Modern migration strategies leverage automation, real-time replication, and intelligent workload optimization to streamline transitions while ensuring business continuity. AWS supports these efforts through purpose-built tools designed to assess, plan, execute, and track cloud migrations with precision [3], [4].

This chapter will help you understand the key AWS migration and transfer services. It details methodologies, best practices, and real-world use cases illustrating how businesses can execute seamless, secure, and efficient cloud transitions.

Structure

This chapter will cover the following topics:

* AWS application migration service (MGN)
* AWS application discovery service
* AWS database migration service (DMS)
* AWS DataSync
* AWS mainframe modernization
* AWS migration hub
* AWS transfer family
* Migration Evaluator (formerly TSO Logic)

Learning Objectives

By the end of this chapter, you will understand the strategic role of AWS migration and transfer services in cloud adoption. You will be able to assess the readiness of the infrastructure. [5] using **AWS Application Discovery Service** and implementing automated, low-risk workload migrations with AWS **Application Migration Service (MGN)** [3]. The chapter will also guide you through using AWS **Database Migration Service (DMS)** [6] You will explore AWS Mainframe Modernization approaches to transition legacy systems to cloud-native architectures for low-downtime relational database migration and AWS DataSync for secure, high-speed transfers between on-premises and AWS storage, manage and watch migration projects using AWS Migration Hub, [7] [8] [9], and conduct secure file transfers via AWS Transfer Family using standard protocols such as SFTP, FTPS, and FTP [12]. Finally, you will analyze migration feasibility and cost efficiency with **AWS Migration Evaluator** [12], and apply best practices to streamline, secure, and improve migration processes across diverse workloads [9].

AWS application migration service

AWS MGN automates the lift-and-shift migration of applications from on-premises environments to AWS with minimal downtime and risk. It replaces older migration services, such as AWS Server Migration Service (SMS), by offering continuous data replication, automated conversion, and real-time monitoring. [7], [10].

Key features

The following features show how AWS MGN streamlines and secures the migration process, minimizing operational disruptions and accelerating time to value.

* **Agentless migration**: Drops the need to install migration agents on source servers, reducing operational overhead and security risks [11].
* **Continuous data replication**: Change Data Capture (CDC) to ensure real-time synchronization between the source and AWS target environments, thereby reducing downtime during cutover [12].
* **Automated machine conversion**: Converts on-premises workloads into AWS-native instances, streamlining deployment [12].
* **Testing and validation**: Provides a controlled test environment to confirm performance before final migration [13].
* **Bandwidth optimization**: Reduces data transfer costs by compressing and improving replication traffic [14].

User scenarios

To better understand AWS MGN's real-world applications, consider the following user scenarios, which show its practical impact across various industries and workloads.

**Scenario 1:** Migrating an E-commerce platform.

One example involves a large e-commerce company using a monolithic on-premises web application. Seeking greater scalability and cost efficiency, the company starts a migration to AWS using AWS MGN, which enables the following process:

1. Continuous replication synchronizes on-premises and AWS environments.
2. The team performs pre-cutover testing in AWS.
3. The final cutover is executed with near-zero downtime.

**Outcome:** Improved scalability, reduced infrastructure costs by 30%, and enhanced disaster recovery capabilities [15].

**Scenario 2:** Financial services CRM migration

A financial institution must migrate a legacy CRM system to AWS without disrupting customer service or compromising compliance. Using AWS MGN, the IT team enabled continuous data replication while preserving service availability throughout the migration. After evaluating the replicated environment and confirming performance benchmarks, the institution transitioned its CRM system to the cloud easily and seamlessly.

**Outcome:** Reduced licensing costs, improved customer experience, and enhanced compliance readiness [16].

Best practices

Organizations should follow the best practices before migrating to AWS MGN to ensure a smooth and secure transition. These guidelines can reduce risk, improve visibility, and maximize migration efficiency.

* Conduct a pre-migration assessment using the AWS Application Discovery Service to analyze dependencies and estimate resource requirements [17].
* Utilize staggered migration waves to minimize the impact on mission-critical applications and keep business continuity during cutover [18].
* Monitor migration progress and infrastructure health using AWS CloudWatch alerts to detect and resolve issues [19] quickly.

Case study

**Accelerating Enterprise Migration with AWS MGN**

A Deloitte-led migration initiative examined a global enterprise undergoing cloud transformation across multiple business units. The company aimed to migrate hundreds of legacy applications to physical and virtual infrastructure in various data centers. Traditionally, these workloads needed extensive manual intervention, posing timelines, downtime, and staff overhead challenges.

By adopting AWS Application Migration Service (MGN), the enterprise automated the lift-and-shift process, enabling near real-time replication of source systems and reducing manual reconfiguration tasks. Teams could confirm and incrementally cut over workloads, using predefined waves based on business criticality.

**Results**: The Deloitte study reported that organizations using AWS MGN achieved **migration speeds that were 50% faster than those using** traditional manual rehosting strategies. Furthermore, teams experienced greater consistency in cutover execution, minimized operational risk, and shortened project timelines. [20].

AWS application discovery service

The AWS Application Discovery Service helps assess on-premises environments before migration by gathering insights into infrastructure, performance, and dependencies. [21].

Key features

Before starting cloud migration, it is essential to understand the current application and infrastructure landscape thoroughly. The AWS Application Discovery Service provides automated tools to uncover critical system data and dependencies, enabling more informed planning and decision-making. Key features include:

* **Agentless data collection**: Gathers server configurations, OS details, and network dependencies without deploying agents [22].
* **Application dependency mapping**: Finds interdependencies between applications, databases, and middleware [23].
* **Performance insights**: Analyzes CPU, memory, and network usage to optimize workload migration planning [24].

User scenarios

Organizations across various industries use the Application Discovery Service to mitigate migration risks, streamline decision-making processes, and improve outcomes. The following example highlights its practical application:

**Scenario 1:** Data centre consolidation

A **multinational corporation** evaluates over 5,000 physical and virtual servers before merging its data centers.

**Outcome:** Found redundant systems, resulting in a 40% reduction in infrastructure costs [25].

Best practices

To maximize the value of AWS Application Discovery Service and ensure a smooth migration experience, organizations should follow recommended strategies that enhance discovery accuracy, streamline workflows, and reduce migration risks. The practices below serve as essential guidelines for effective implementation.

* **Use AWS Migration Hub strategy recommendations** to define migration paths [26].
* **Enable automated discovery** for VMware environments [27].

Case study

A 2023 Forrester report examined a global insurance provider that integrated AWS Application Discovery Service into its pre-migration strategy. Facing growing costs and performance limitations in its on-premises infrastructure, the company started a migration involving over 300 applications. By using automated discovery and dependency mapping:

* The IT team reduced manual discovery efforts by 70%.
* Migration sequencing was fine-tuned to avoid unexpected application outages.
* The company found legacy systems that could be retired, further accelerating its modernization efforts.

**Result**: The company achieved a 35% reduction in post-migration performance issues and a 25% decrease in migration time. Forrester concluded that early visibility enabled by discovery tools was a decisive factor in the project's success. [28].

AWS database migration service

AWS DMS simplifies and accelerates database migration to AWS, resulting in minimal downtime and disruption. It supports **homogeneous migrations** (e.g., Oracle to Oracle) and **heterogeneous migrations** (e.g., SQL Server to Amazon Aurora), ensuring data integrity and consistency. [6].

Key features

AWS Database Migration Service provides capabilities designed to simplify and accelerate database migration to the cloud. The following features ensure dependable, efficient, and secure migrations with minimal disruption to ongoing business operations.

* **Continuous data replication**: Uses Change Data Capture (CDC) to replicate live database updates in near real-time [29].
* **Automated schema conversion**: AWS Schema Conversion Tool (SCT) helps cross-engine migrations [8].
* **Minimal downtime**: Ensures business continuity by replicating changes as the source database stays operational [9].
* **Support for multiple database engines**: Supports MySQL, PostgreSQL, SQL Server, Oracle, and Amazon Redshift [30].

User scenarios

**Scenario 1:** Migrating an on-premises Oracle database to Amazon RDS

A financial services company migrates a transactional Oracle database to **Amazon RDS for Oracle**, reducing operational overhead and improving resilience.

**Outcome:** 50% reduction in database administration efforts, 30% cost savings on infrastructure [31].

**Scenario 2:** SQL Server to Amazon Aurora migration

A SaaS company migrates from SQL Server to **Amazon Aurora PostgreSQL** to improve cost and performance.

**Outcome:** Ended SQL Server licensing costs, achieving a 35% improvement in query performance [14].

Best practices

To maximize the effectiveness of your database migration strategy, it's important to apply best practices that address schema compatibility, data validation, and operational continuity. The recommendations below aim to reduce migration risk and enhance post-migration performance.

* **Use AWS SCT for schema validation and conversion**. The AWS Schema Conversion Tool (SCT) helps identify compatibility issues between source and target databases, automatically converting schemas and allowing developers to focus on business logic [7].
* **Enable CDC for minimal downtime and faster cutover**. Change Data Capture (CDC) ensures near real-time synchronization between the source and target databases, enabling the migration of workloads with minimal service interruption [10].
* **Perform data validation using AWS DMS validation tools** – DMS offers built-in validation capabilities that compare source and target datasets, helping you verify accuracy and completeness after the migration. [11].

Case study

A Forrester study examined a multinational e-commerce enterprise with multiple on-premises data centers and legacy relational databases. With rising licensing costs, complex backup routines, and scalability challenges, the company migrated its mission-critical databases to AWS using **AWS Database Migration Service (DMS)**.

**Approach:**  
The team used AWS SCT to convert their Oracle schema into Amazon Aurora PostgreSQL format. They enabled Change Data Capture to keep the new environment synchronized with the legacy system throughout the migration period. After performing rigorous validation using DMS tools, the team executed a final cutover with near-zero downtime.

**Outcome:**  
The migration timeline was shortened by 45% compared to earlier manual approaches. The company reported a 60% reduction in database administration efforts, significant improvements in application responsiveness, and projected annual infrastructure cost savings of over $1.2 million. [10].

AWS DataSync

AWS DataSync helps with high-speed, secure data transfers between on-premises storage and AWS storage services, including Amazon S3, Amazon EFS, and Amazon FSx [12].

Key features

AWS DataSync provides features that simplify data movement from on-premises storage to AWS, ensuring efficient, secure, and scalable file transfers. The key capabilities highlighted below are designed to accelerate migration projects while preserving data integrity and reducing operational overhead.

• **Accelerated data transfers**—This method uses purpose-built agents and parallel processing to transfer data up to 10 times faster than traditional tools, such as rsync or FTP.

• **Incremental sync** – Only modified or new files are transferred, minimizing bandwidth consumption and transfer time [14].

• **Encryption and data integrity checks** – Transfers are encrypted in transit and confirmed with checksums to guarantee data is complete and secure [15].

• **Support for multiple storage solutions** – Compatible with a wide range of Network Attached Storage (NAS), Storage Area Networks (SAN), and file servers, offering flexibility for diverse IT environments [16].

User scenarios

AWS DataSync supports different use cases across industries that require secure and high-throughput data movement.

**Scenario 1:** Large-scale media file migration

A global media and entertainment company must migrate petabytes of archived video content and raw production footage from its on-premises storage system to Amazon S3. The migration aimed to reduce dependency on local infrastructure and enhance content accessibility for post-production teams across regions.

**Outcome:** AWS DataSync completed the transfer 50% faster than legacy tools, improved data availability, and reduced long-term storage costs by using Amazon S3 Glacier for archiving [17].

**Scenario 2: Retail inventory data synchronization**

A multinational retail chain with distributed data centers faced challenges in keeping correct real-time inventory records. The company deployed AWS DataSync to replicate sales and inventory data across regions, synchronizing data from point-of-sale systems to Amazon FSx for Files.

**Outcome:** This resulted in a 35% improvement in stock tracking accuracy, enabling regional inventory systems to stay synchronized with headquarters in real-time [18].

Best practices

Applying proven AWS DataSync strategies can improve transfer performance, reduce costs, and ensure long-term efficiency.

• **Use AWS Direct Connect for large-scale data transfers** – Leverage Direct Connect to create a dedicated network link that improves speed, security, and reliability during massive file migrations [26].

* Schedule off-peak incremental syncs to improve costs. Running sync jobs during off-peak hours minimizes the cost impact of data transfer and reduces interference with production workloads [20].
* Enable Amazon S3 lifecycle rules for long-term storage optimization — Use S3 lifecycle policies to automatically transition data to cost-effective storage classes, such as S3 Glacier or S3 Intelligent-Tiering [21].

Case study

A **Deloitte report** profiled a multinational pharmaceutical company undergoing a digital transformation initiative. The firm needed to migrate vast volumes of clinical trial data from local research centers to AWS to enhance collaboration, improve regulatory compliance, and help with disaster recovery.

**Approach:**  
Using AWS DataSync, the IT team installed agents across six global research sites, enabling secure and continuous data transfers to Amazon S3. With support for incremental sync and scheduled jobs, they reduced network congestion and kept consistent updates.

**Outcome:**  
The company reported a 45% decrease in manual IT intervention related to file movement and synchronization. Compliance reports were generated faster, research teams gained access to shared datasets faster, and data security improved significantly. The switch to AWS storage also lowered infrastructure costs and increased scalability across research workflows. [22].

AWS mainframe modernization

AWS Mainframe Modernization offers a structured migration framework for transitioning legacy mainframe applications to **cloud-native architectures** [12].

Key features

Modernizing mainframe workloads requires flexibility and a well-defined strategy. AWS Mainframe Modernization provides two tailored paths — rehosting and refactoring—designed to accelerate the transition from legacy environments to cloud-native architectures.

* **Rehosting (Lift-and-Shift) –** Migrates mainframe workloads directly to Amazon EC2 with minimal modifications, enabling faster time-to-cloud [24].
* **Refactoring for Cloud-Native Services –** Deconstructs monolithic legacy applications into a microservices architecture using AWS Lambda, Amazon DynamoDB, and other serverless technologies [25].
* **• Automation & DevOps Integration –** Supports integration with CI/CD pipelines using tools like AWS CodePipeline and CodeDeploy, enhancing the agility of modernized workloads [26].

User scenarios

Organizations across various sectors have successfully transitioned away from mainframe systems by utilizing AWS's modernization tools. The examples below illustrate how AWS Mainframe Modernization delivers performance, cost savings, and innovation.

**Scenario 1: Banking system modernization**

A global financial institution's COBOL-based transaction system running on an aging mainframe faced scalability limitations and high operational costs. The bank adopted a rehosting strategy using AWS Mainframe Modernization to address these challenges.  
**Outcome:** The migration to Amazon EC2 cut infrastructure costs by 50%, and the system now supports scalable transactions, handling double the earlier volume with ease [27].

**Scenario 2: Insurance claims processing automation**

An insurance company’s legacy claims platform struggled with latency and maintenance inefficiencies. The organization refactored its monolithic mainframe application using AWS Lambda and Amazon DynamoDB.

**Outcome:** This resulted in a 40% improvement in claims processing speed and a 35% reduction in overall maintenance costs, streamlining both internal workflows and customer service [28].

Best practices

AWS recommends different strategies to maximize the value of mainframe modernization initiatives. These practices help reduce risk and improve outcomes during migration and post-modernization operations.

* Use A**WS Migration Evaluator for cost-benefit analysis** – Evaluate financial and technical feasibility before initiating rehosting or refactoring [7].
* **Refactor gradually instead of all at once** – Reduce migration risks by incrementally transforming legacy components into cloud-native microservices [32].
* **Leverage AWS DevOps tools for automated deployment** – Use tools like AWS CodeBuild and CodeDeploy to automate infrastructure provisioning, application deployment, and testing [25].

Case study

A **McKinsey report** examined the transformation journey of a leading logistics provider with over 20 years of mainframe-based operations. The organization looked to simplify the complexity of its legacy systems, which were costly to keep and hindered rapid innovation.

**Approach:**  
The company used AWS Mainframe Modernization to migrate its mission-critical scheduling system to Amazon EC2. Then, using AWS Lambda and Amazon Aurora, it gradually refactored submodules, including billing, route planning, and reporting, into microservices.

**Outcome:**  
The enterprise achieved a **50% reduction in deployment cycles**, enabling more frequent software releases and operational improvements. Application performance improved due to elasticity and automation, resulting in a 45% decrease in ongoing infrastructure costs. The modernization project also enabled the company to introduce AI-driven logistics features previously impossible on the mainframe. [33].

AWS migration hub

AWS Migration Hub provides centralized tracking of migration projects, offering a unified view of application dependencies, real-time migration progress, and integration with various AWS migration tools. It enables large-scale migrations to be checked and orchestrated effectively across teams and workflows. [23]

Key features

This section outlines the core functionalities of AWS Migration Hub that support planning, visibility, and operational control during migration.

* **Unified migration dashboard**: Monitors application status, dependencies, and migration readiness [23].
* **Integration with AWS migration services**: Works with AWS DMS, AWS MGN, and AWS SMS to offer a centralized view [34].
* **Customizable workflows**: Enables phased or wave-based migration strategies tailored to organizational goals [35].

User scenarios

Real-world examples show the effectiveness of AWS Migration Hub across various industries and complex migration scenarios.

**Scenario 1:** Large-scale data center consolidation

A global retailer aimed to shut down six regional data centers and move all workloads to AWS within 12 months. Using AWS Migration Hub:

1. The IT team watched hundreds of applications and dependencies across multiple AWS accounts.
2. They created migration waves and tracked each through the dashboard.
3. Downtime was minimized by coordinating DMS and MGN progress through a centralized interface.

Outcome: 30% reduction in infrastructure costs and 99.9% migration uptime [36].

**Scenario 2**: Multi-Application Migration for Enterprises

A financial institution must migrate over 200 interdependent applications while ensuring service continuity. Migration Hub provided:

* Real-time dependency visualization
* Progress metrics across AWS services

**Outcome**: 40% fewer migration errors and optimized scheduling and resource allocation [45].

Best practices

To maximize the effectiveness of AWS Migration Hub, consider the following practices before and during migration.

* Conduct migration readiness assessments to decide the scope and feasibility [37].
* Utilize AWS Migration Evaluator for financial modeling and total cost of ownership (TCO) analysis [38].
* Leverage AWS CloudWatch for proactive performance and error monitoring [48].

Case study

A Deloitte analysis found that 90% of enterprises using AWS Migration Hub reported reduced project delays, improved dependency tracking, and increased stakeholder alignment. Using Migration Hub’s unified dashboard, IT teams experienced faster decision-making, improved planning, and better communication across departments, especially for migrations involving multiple application owners and business units. [39].

AWS transfer family

AWS Transfer Family delivers secure, managed file transfer capabilities that support SFTP, FTPS, and FTP protocols. It enables the seamless migration of legacy file exchange workflows to AWS without requiring changes to client-side applications or server-side integrations. [40].

Key features

This section presents the core capabilities of AWS Transfer Family that enable high-security, scalable file transfer solutions.

* **No need for self-managed FTP servers**: AWS manages infrastructure, patching, and availability [41].
* **Direct integration with Amazon S3 and EFS**: Provides scalable, elastic storage for incoming and outgoing files [42]; [43]
* **End-to-end encryption and access controls**: Uses IAM, VPC endpoints, and audit logging to ensure secure data handling [44].

User scenarios

These scenarios show how AWS Transfer Family helps file-based workflows across various industries.

**Scenario 1:** Secure financial data exchange

A multinational bank migrated its internal file-sharing system to AWS Transfer Family to meet stringent compliance requirements.

* SFTP-based workflows were replicated with no change to client-side tools.
* Access was controlled using IAM and integrated with corporate identity providers.

**Outcome**: Improved regulatory compliance and reduced manual intervention for file handling [45]

**Scenario 2: Automated media backup to Amazon S3**

A media production company needed to automate backups of large video files from on-premises editing systems to the cloud.

* Transfer Family was used to schedule and authenticate secure transfers via FTPS.
* Amazon S3 lifecycle rules were applied to move content to lower-cost storage tiers.

**Outcome**: 40% faster backup completion and a 35% reduction in operational overhead costs [46].

Best practices

Follow these guidelines to ensure secure, cost-efficient, and universally available file transfer workflows.

* Implement IAM-based access control to enforce the principle of least privilege [47].
* Enable S3 lifecycle policies to archive or transition files to cost-effective storage classes [48].
* Monitor and audit all transfer activity using AWS CloudTrail logs [49].

Case study

A Forrester report revealed that companies using AWS Transfer Family experienced a 45% decrease in security incidents associated with file transfers. Automating compliance checks, removing manual FTP infrastructure, and seamlessly integrating with IAM and S3 were the primary drivers of improved outcomes [59].

Migration evaluator (formerly TSO Logic)

AWS Migration Evaluator helps enterprises assess the feasibility of cloud migration by offering automated insights on cost savings, workload right-sizing, and total cost of ownership (TCO) comparisons between on-premises and AWS environments.

Initially launched as TSO Logic, the tool was purchased by AWS in 2019 and later rebranded as **AWS Migration Evaluator** to reflect its deeper integration into the AWS ecosystem. While the underlying capabilities remained focused on infrastructure discovery and cost analysis, the rebranding signaled a shift toward tighter alignment with AWS migration services and a streamlined experience for cloud planning. The new name highlights its core function—evaluating AWS migrations' feasibility and return on investment (ROI)while emphasizing automation, scalability, and AWS-native reporting dashboards. The transition also brought enhancements in usability, expanded data sources, and improved integration with tools like AWS Migration Hub and AWS Application Discovery Service.

Key features

This section highlights the capabilities that make Migration Evaluator essential for migration planning and business case justification.

* **Automated infrastructure discovery**: Collects detailed inventory of compute, storage, and usage metrics [39].
* **TCO analysis**: Compares current IT spend with projected AWS costs based on usage patterns [39].
* **Workload right-sizing**: Suggests the best AWS services and instance types for migration targets [7].

Case study

A PwC study reported that a global financial institution used AWS Migration Evaluator to accelerate cloud adoption by 50%. By collecting telemetry from over 2,000 servers, the tool has achieved $1.2 million in potential annual savings by reducing overprovisioned compute resources and combining underutilized databases. These insights supported executive buy-ins and helped align cloud strategy with financial targets [64].

Conclusion

AWS Migration and transfer services provide structured, automation-driven tools that streamline cloud adoption while minimizing risk and downtime. This chapter explores methodologies for workload migration, database replication, large-scale data transfer, and mainframe modernization, equipping organizations with best practices for executing efficient and cost-effective migrations. [50], [32].

Migration is only the first step. Organizations must adhere to AWS’s Well-Architected Framework to maximize operational resilience, ensuring workloads are secure, high-performing, and cost-optimized. Chapter 14 examines the six key pillars of the Well-Architected Framework and how businesses can continually enhance their AWS environments for long-term success. [46].

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