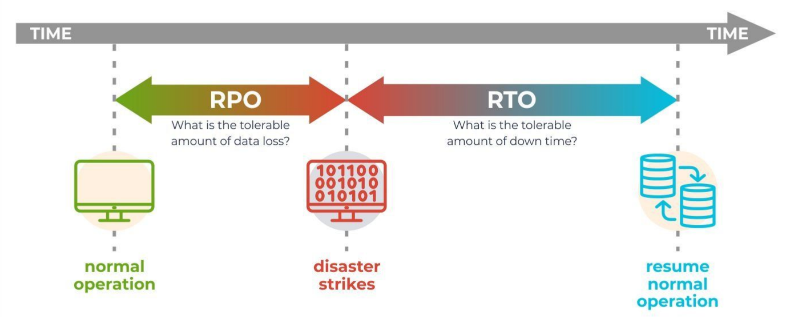
Disaster Recovery Overview

Disaster recovery (DR) in AWS is about preparing for outages and recovering services within defined time (RTO) and data-loss (RPO) objectives. DR strategies span a spectrum:

1. Backup & Restore: Periodic backups, manual restore.
2. Pilot Light: Core services always running; scale up after failover.
3. Warm Standby: Minimal environment running; scale to full capacity on demand.
4. Multi-Site (Hot-Site): Full production environments active in multiple regions, with traffic distributed.

- Choosing the right DR pattern balances cost against required RTO/RPO.

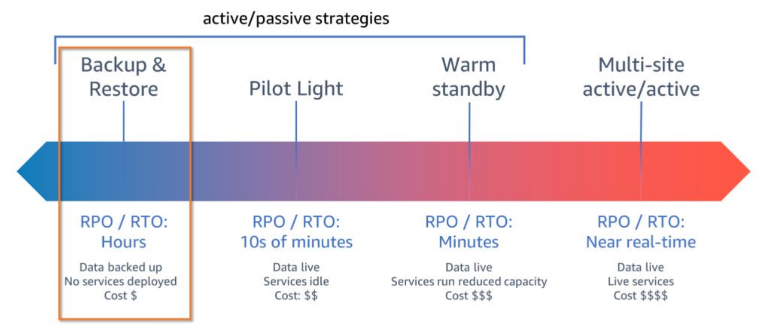


Backup and Restore (High RPO)

The Backup and Restore pattern involves taking periodic snapshots or backups of your data—such as EBS snapshots, RDS snapshots, or S3 versioned/object locks—and storing them in durable, off-site storage (e.g., S3 Standard or Glacier). In a disaster, you recreate infrastructure (via CloudFormation or AMIs) and restore data from those backups. This approach has:

- High RPO: Data loss equals the interval between backups (e.g., up to 24 hours).
- High RTO: Time needed to provision infrastructure and restore data.
- Lowest Cost: Only pay for storage of backups and occasional retrieval.

Use Case:
A non-critical test environment backs up its databases nightly to S3 and spins up new resources from CloudFormation templates when needed after failures.



Pilot Light

Pilot Light keeps the most critical core components of your environment running continuously in a secondary region. Typically, this includes minimal database servers, authentication systems, and configuration data. In a DR event, you quickly provision additional infrastructure—such as application servers, load balancers, and caches—using infrastructure-as-code (e.g., CloudFormation) and connect them to the already-running core. This results in:

- Reduced RTO: Core systems are already active; only additional capacity needs to be spun up.
- Moderate RPO: Core data (e.g., database) is replicated continuously or via frequent backups.
- Balanced Cost: You pay for minimal resources 24/7 and scale up resources only when needed.

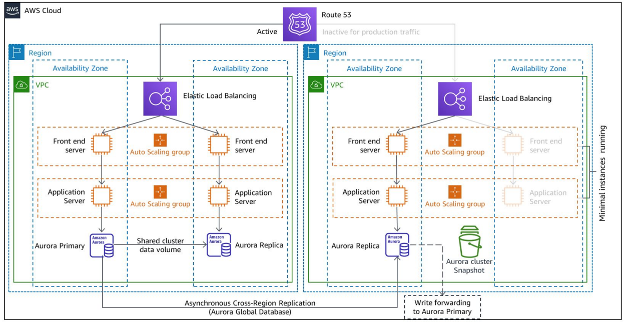
Use Case:
A SaaS provider runs a pilot-light database cluster and authentication service in a secondary region. Upon primary-region failure, they deploy application servers and networking components via CloudFormation to restore full service quickly.

Warm Standby

Warm Standby maintains a scaled-down but fully functional version of your production environment in a secondary region. Core components (e.g., databases, application servers, and services) run at reduced capacity (e.g., smaller instance sizes or fewer nodes). In a DR event, you increase capacity to full production levels by scaling up or adding additional resources. This approach offers:

- Lower RTO: Environment is already configured and running; only scaling is required.
- Low-to-Moderate RPO: Data is continuously replicated, ensuring minimal data loss.
- Medium Cost: Paying for reduced-capacity resources 24/7, plus incremental cost during failover.

Use Case:
An online gaming platform runs smaller “warm” game server instances and replica databases in a secondary region. When the primary region fails, the team scales these up to full capacity to seamlessly continue gameplay.

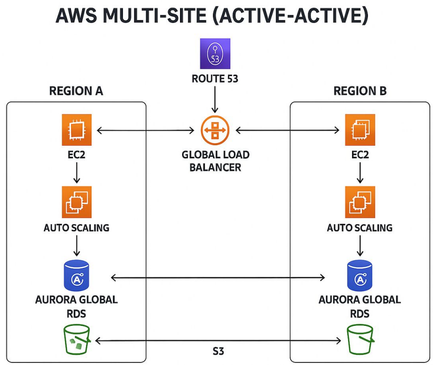


Multi-Site / Hot Site Approach

In the Multi-Site (Hot-Site) DR model, you run fully provisioned, production-grade environments concurrently in two or more AWS Regions. Traffic is distributed—often via a global DNS service or Global Accelerator—so both sites actively serve requests. Data synchronization occurs continuously, typically using cross-region replication for databases and storage. This approach delivers:

- Minimal RPO: Near-zero data loss due to continuous data replication.
- Minimal RTO: No recovery time since secondary site is live; failover is instantaneous.
- Highest Cost: You pay for full infrastructure in all active locations 24/7.

Use Case:
A global video streaming company operates active streaming endpoints in us-east-1 and eu-west-1 behind Route 53 weighted records. User requests are routed to the healthiest region, and databases replicate continuously to ensure seamless failover without data loss.

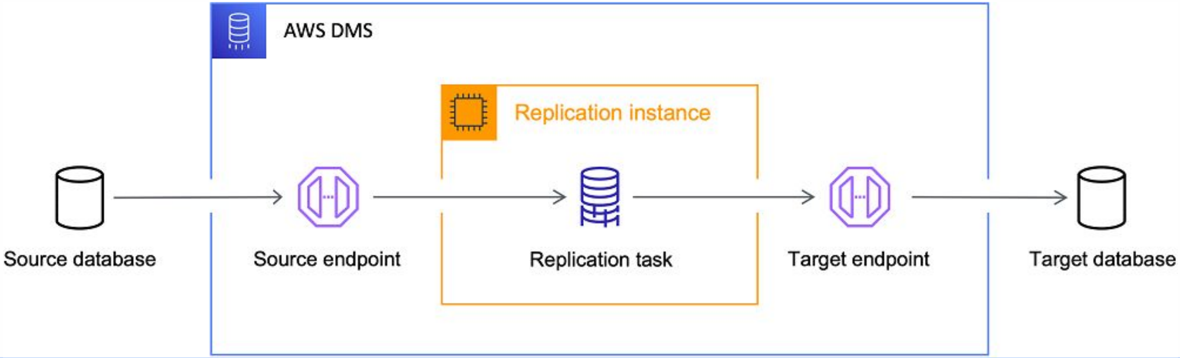


AWS Database Migration Service (DMS)

AWS DMS helps migrate databases to AWS quickly and securely with minimal downtime. It supports homogeneous migrations (same engine, e.g., Oracle → Oracle) and heterogeneous migrations (different engines, e.g., Oracle → Amazon Aurora). DMS continuously replicates data changes from the source to the target until cutover. Supported sources and targets include:

1. Sources: Oracle, SQL Server, MySQL, PostgreSQL, MongoDB, Amazon S3 (via CSV/Parquet).
2. Targets: Amazon Aurora, PostgreSQL, MySQL, Oracle, MariaDB, Amazon Redshift, Amazon DynamoDB, Amazon S3.

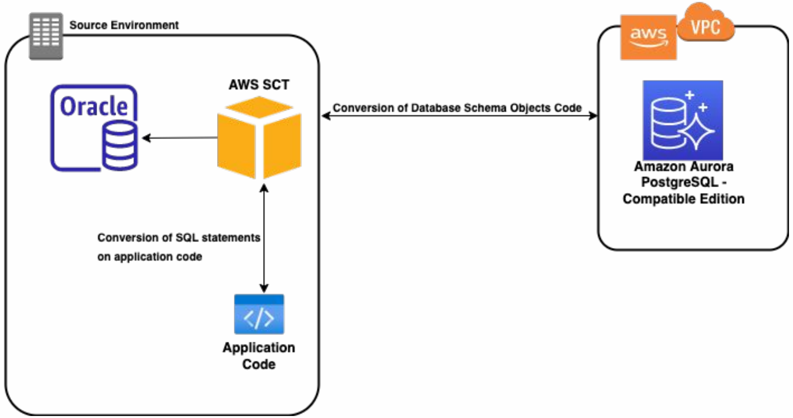
Use Case:
A retail company uses DMS to migrate its on-premises MySQL database to Amazon Aurora with continuous change data capture, allowing the legacy system to remain online until the final cutover.



AWS Schema Conversion Tool (SCT)

AWS SCT automates the conversion of database schemas and application code for heterogeneous migrations. It analyzes your source database (e.g., Oracle, SQL Server) and generates a target schema for engines like Amazon Aurora PostgreSQL, MySQL, or Redshift. SCT also helps migrate stored procedures, functions, and SQL code by providing assessment reports on compatibility and recommendations for manual adjustments.

Use Case:
A financial services firm uses SCT to convert its on-premises Oracle data warehouse schema to Amazon Redshift, receiving a detailed assessment report and auto-generated scripts for schema and code conversion.

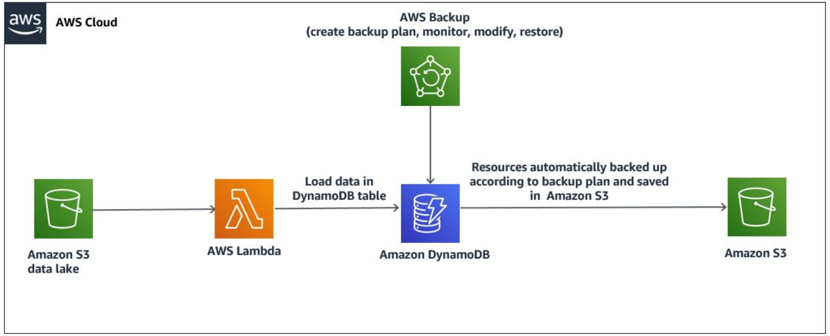

Source Environment
Oracle
AWS SCT
Conversion of SQL statements on application code
Application Code
Conversion of Database Schema Objects Code
aws
VPC
Amazon Aurora PostgreSQL - Compatible Edition

AWS Backup

AWS Backup is a centralized backup service that automates and consolidates data protection across AWS services and on-premises environments. It provides:

- Policy-based backups: Define backup plans with schedules, retention periods, and lifecycle rules.
- Cross-service support: Covers Amazon EBS, RDS, DynamoDB, EFS, Storage Gateway, and more.
- Cross-Region and Cross-Account: Copy backups to other regions or accounts for resiliency.
- Restore flexibility: Restore to original or alternate resources, with point-in-time recovery for supported services.
- Compliance reporting: Track backup activity and compliance via AWS Backup Audit Manager.

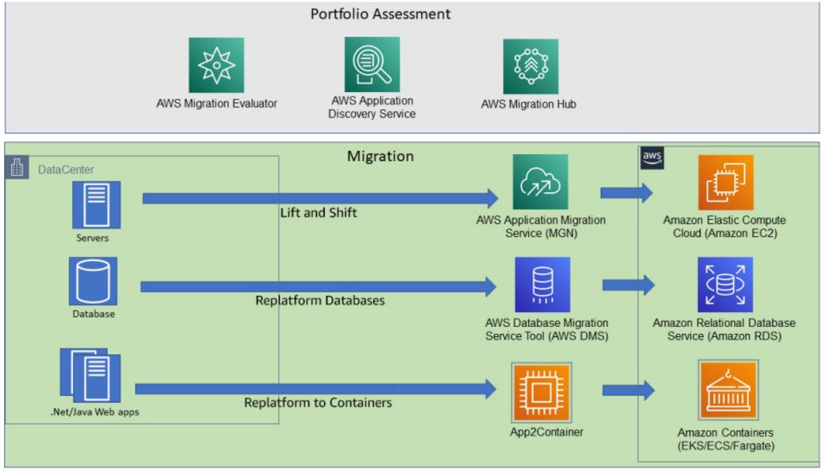
Use Case:
A healthcare provider creates a backup plan that automatically snapshots EBS volumes and RDS databases daily, retains them for 90 days, and copies critical backups to a second region for regulatory compliance.


aws
AWS Cloud
AWS Backup
(create backup plan, monitor, modify, restore)
Amazon S3
data lake
AWS Lambda
Load data in
DynamoDB table
Amazon DynamoDB
Resources automatically backed up
according to backup plan and saved
in Amazon S3
Amazon S3

AWS Application Discovery Service

AWS Application Discovery Service helps you plan migration projects by automatically collecting configuration, usage, and behavior data from on-premises servers. It discovers server details (CPU, memory, disk, network), running processes, and file dependencies. Data can be exported to AWS Migration Hub to visualize application dependencies and prioritize migration waves.

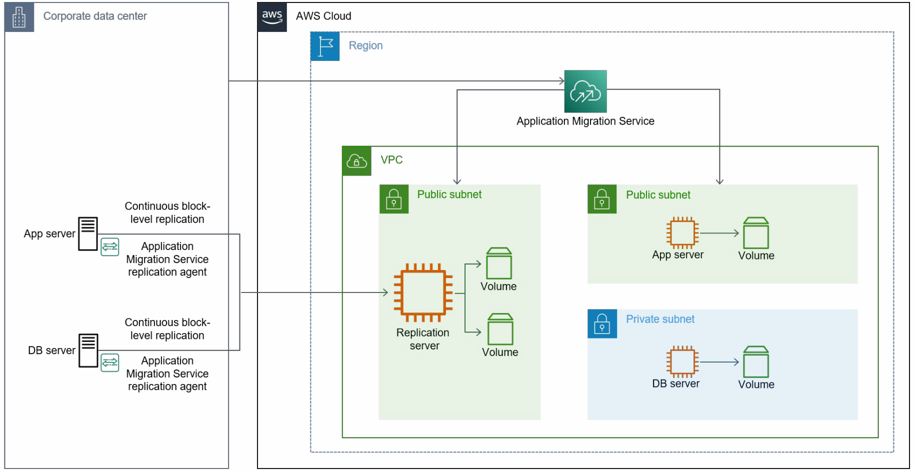
Use Case:
An enterprise uses Discovery Service agents on its data center servers to map inter-server dependencies and resource utilization, feeding Migration Hub to design phased migration waves to AWS.


Portfolio Assessment
AWS Migration Evaluator
AWS Application Discovery Service
AWS Migration Hub
Migration
DataCenter
Servers
Lift and Shift
AWS Application Migration Service (MGN)
Amazon Elastic Compute Cloud (Amazon EC2)
Database
Replatform Databases
AWS Database Migration Service Tool (AWS DMS)
Amazon Relational Database Service (Amazon RDS)
.Net/Java Web apps
Replatform to Containers
App2Container
Amazon Containers (EKS/ECS/Fargate)
aws

AWS Application Migration Service (MGN)

AWS Application Migration Service (MGN) simplifies lift-and-shift migrations by replicating entire server volumes from on-premises or cloud environments to AWS in real time. It converts and launches servers as EC2 instances with minimal downtime. Key features include continuous block-level replication, automated conversion of machine images, and orchestration of cutover workflows.

Use Case:
A media company uses MGN to migrate hundreds of on-premises VMware virtual machines to AWS by setting up replication agents, testing launched instances in staging, and performing a coordinated cutover during a scheduled maintenance window.


Corporate data center
App server
Continuous block-level replication
Application Migration Service replication agent
DB server
Continuous block-level replication
Application Migration Service replication agent
AWS Cloud
Region
Application Migration Service
VPC
Public subnet
Replication server
Volume
Volume
Public subnet
App server
Volume
Private subnet
DB server
Volume

VMware Cloud on AWS

VMware Cloud on AWS integrates VMware's software-defined data center (SDDC) stack—including vSphere, vSAN, and NSX—on AWS infrastructure. It enables enterprises to run and manage VMware workloads with the same tools and processes they use on-premises, while leveraging AWS services for networking (Elastic Load Balancing, Direct Connect), storage (EBS, S3), and security.

- Seamless extension: Stretch on-premises vSphere clusters to AWS for capacity or DR.
- High-performance networking: NSX networking integrates with AWS VPC and Direct Connect.
- Hybrid operations: Single pane of glass via vCenter and VMware HCX for migrations.

Use Case:
An enterprise extends its on-premises VMware environment into AWS to handle end-of-quarter capacity spikes by adding VMware Cloud SDDC hosts on demand, without rearchitecting applications.

DR Exam Questions

A company needs to minimize downtime (low RTO) and data loss (low RPO) by running fully active environments in primary and secondary AWS regions. Which DR strategy should they choose?

A. Backup and Restore

B. Pilot Light

C. Warm Standby

D. Multi-Site (Hot-Site)

Your organization must centrally manage backups for Amazon RDS, EFS, and DynamoDB with policy-based scheduling, cross-account copy, and automated retention. Which service fulfills these requirements?

A. AWS Snapshot Manager

B. AWS Backup

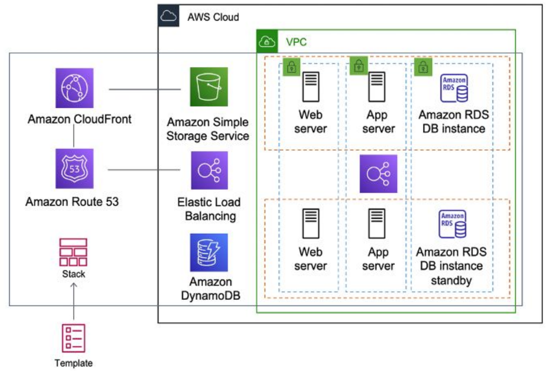
C. AWS Application Migration Service

D. AWS Systems Manager

AWS CloudFormation

AWS CloudFormation is an infrastructure-as-code service that lets you define and provision AWS resources using YAML or JSON templates. You declare the desired state—networks, servers, databases, permissions—and CloudFormation handles the creation, update, and deletion in the correct order, managing dependencies and rollback on failure.

- Repeatability & Consistency: Deploy identical environments across accounts and regions.
- Automation & Speed: Launch complex stacks in minutes rather than manually clicking through consoles.
- Version Control & Auditing: Store templates in source control to track changes and enable peer review.
- Drift Detection: Identify when running resources diverge from the template.
- Rollback on Failure: Automatic cleanup of partially created stacks to maintain consistency.



CloudFormation – Service Role

A CloudFormation Service Role is an IAM role that you can specify for a stack to grant CloudFormation the permissions it needs to create, update, or delete resources on your behalf. By using a service role rather than relying on the user's permissions, you ensure:

- Least Privilege: The role only has rights defined by its policy, reducing risk.
- Separation of Duties: Admins can restrict which resources CloudFormation can manage, independent of the user.
- Cross-Account Stacks: Service roles allow stacks in one account to provision resources in another securely.

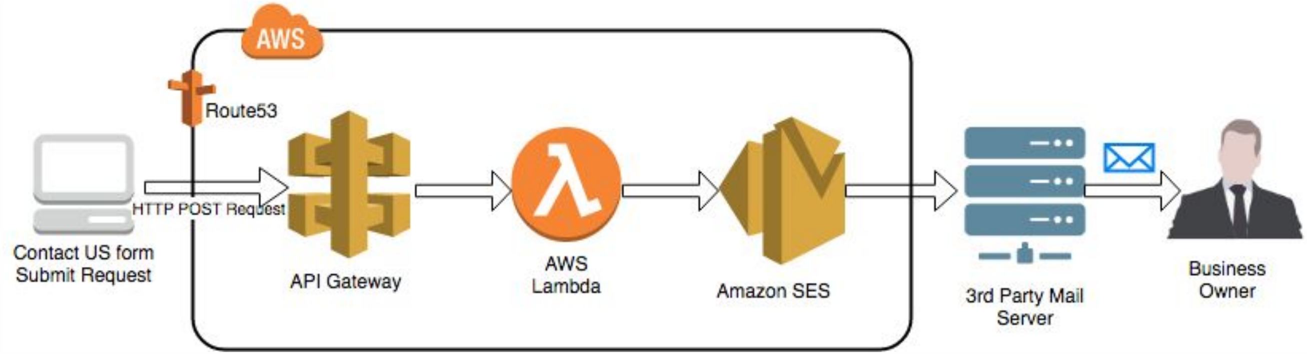
Use Case:
An enterprise CI/CD pipeline assumes a CloudFormation Service Role in the production AWS account, enabling automated stack deployments with exactly scoped permissions, without granting the CI/CD user full administrative rights.

Amazon Simple Email Service (SES)

Amazon SES is a scalable, cost-effective service for sending and receiving transactional, marketing, or mass emails. SES provides:

- Sending Options: SMTP interface, SES API, or AWS SDKs.
- Receiving: Inbound email processing with rules to store, trigger Lambda, or publish to SNS.
- Deliverability Tools: Configuration sets, dedicated IPs, DKIM, and reputation dashboards.
- Integration: With CloudWatch for metrics and AWS CloudTrail for audit logs.

Use Case:
A retail application uses SES to send order confirmations and shipping notifications. Inbound bounce and complaint events trigger SNS topics, which notify the support team for follow-up.

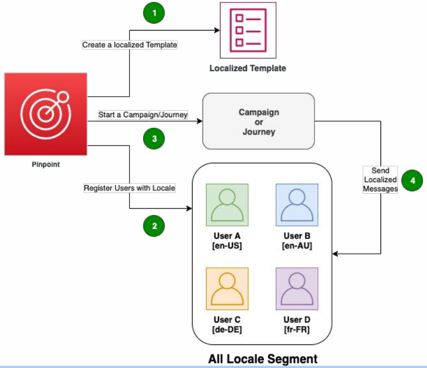


Amazon Pinpoint

Amazon Pinpoint is a flexible, multi-channel marketing communications service for transactional and targeted messaging (email, SMS, push notifications, and voice). Key features include:

- Segmentation & Campaigns: Define user segments based on behavior or attributes and launch personalized campaigns.
- Analytics & Engagement Tracking: Track open rates, click-throughs, and deliverability metrics.
- Transactional Messaging: Send high-throughput transactional emails or SMS (e.g., OTP, order updates).
- Journey Builder: Automate multi-step customer journeys with conditional flows and messaging at each stage.

Use Case:
A mobile app uses Pinpoint to send targeted push notifications to users who abandoned their shopping carts, then follows up with SMS reminders if users don’t re-engage within 24 hours.



Systems Manager

AWS Systems Manager provides several operational capabilities:

1. Run Command: Execute commands or scripts remotely on groups of managed instances without SSH, using pre-defined or custom documents.

2. Patch Manager: Automate scanning and patching of operating systems and applications across your fleet based on patch baselines and maintenance windows.

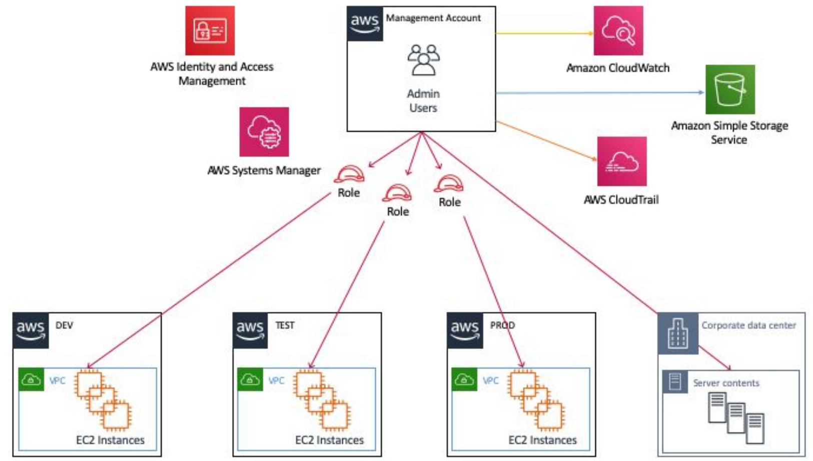
3. Maintenance Windows: Schedule and coordinate routine operational tasks—like patching, updates, or scripts—during defined time slots to minimize disruption.

4. Automation: Define reusable workflow documents (SSM Automation documents) to automate common operational tasks—such as AMI creation, instance recovery, or configuration enforcement—and execute them on demand or on schedule.

Systems Manager – SSM Session Manager

AWS Systems Manager Session Manager provides secure, browser-based shell or RDP access to EC2 instances, on-premises servers, and virtual machines without opening inbound ports or managing SSH keys. It operates over HTTPS and uses IAM policies for access control, auditability, and optional AWS KMS encryption of session data.

Use Case (English):
A DevOps team uses Session Manager to troubleshoot production EC2 instances behind private subnets without exposing SSH ports or distributing key pairs.

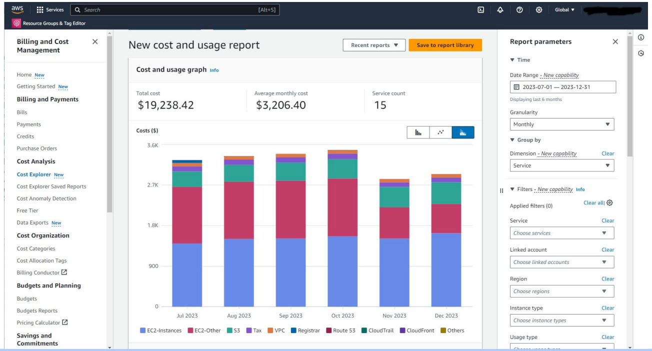


AWS Cost Explorer

AWS Cost Explorer is a native tool for visualizing, analyzing, and forecasting your AWS spending. It provides:

- Interactive Charts: Break down costs by service, account, region, tags, or usage type over time.
- Cost and Usage Reports: Access detailed usage records and export data for external analysis.
- Forecasting: Predict future costs and usage patterns based on historical trends.
- Reservation Recommendations: Identify underutilized or expiring Reserved Instances and Savings Plans to optimize commitments.

Use Case:
A finance team reviews monthly spend trends in Cost Explorer, identifies a spike in EC2 usage in one project, and adjusts instance sizes to reduce costs next month.



New cost and usage report

Cost and usage graph

Total cost $19,238.42

Average monthly cost $3,206.40

Service count 15

Report parameters

▼ Time

Date Range - New capability: 2023-07-01 — 2023-12-31

Displaying last 6 months

Granularity: Monthly

▼ Group by

Dimension - New capability: Service

▼ Filters - New capability

Applied filters (0)

Service: Choose services

Linked account: Choose linked accounts

Region: Choose regions

Instance type: Choose instance types

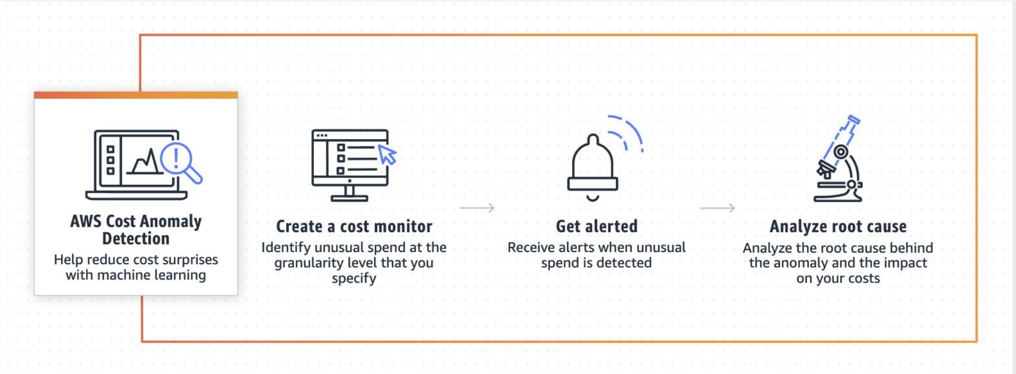
Usage type

AWS Cost Anomaly Detection

AWS Cost Anomaly Detection is a machine-learning–powered tool that continuously monitors your AWS spend and usage to detect unusual cost patterns. You create alerts based on budgets or custom monitors, and the service notifies you via Amazon SNS when anomalies—like unexpected spikes—occur. Features include:

- Behavior Learning: Automatically models normal spending behavior per service, region, or linked account.
- Alert Thresholds: Define sensitivity and deviation thresholds for alerts.
- Integration: Tie into budgets, Cost Explorer, and AWS Chatbot for real-time Slack or SNS notifications.

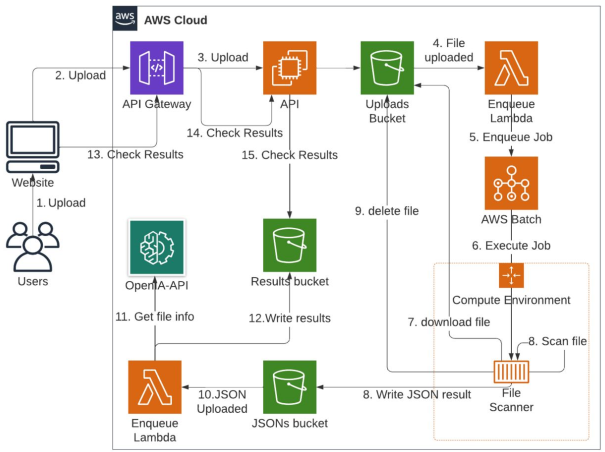
Use Case:
An operations team configures anomaly detection for Lambda and S3 spend. When a misconfigured function begins generating unexpectedly high invocation


AWS Cost Anomaly Detection
Help reduce cost surprises with machine learning
Create a cost monitor
Identify unusual spend at the granularity level that you specify
Get alerted
Receive alerts when unusual spend is detected
Analyze root cause
Analyze the root cause behind the anomaly and the impact on your costs

AWS Batch

AWS Batch enables you to easily run large-scale batch computing workloads on AWS. It dynamically provisions the optimal compute resources—using EC2 On-Demand, Spot, or Fargate—based on job requirements. You define job definitions, job queues, and compute environments, and Batch handles job scheduling, retries, and scaling.

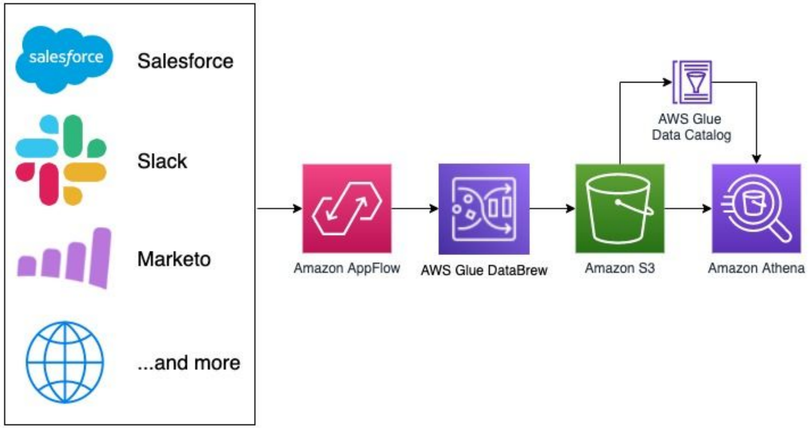
Use Case:
A genomics research team submits thousands of DNA analysis jobs to AWS Batch. Batch automatically scales out Spot-backed compute environments to process the data, and tears them down when complete to minimize costs.



Amazon AppFlow

Amazon AppFlow is a fully managed integration service that enables you to securely transfer data between SaaS applications (e.g., Salesforce, ServiceNow, Slack) and AWS services (e.g., S3, Redshift, Salesforce). It supports bidirectional data flows, event-triggered or scheduled transfers, and built-in data transformations such as filtering, mapping, and masking.

Use Case:
A marketing team uses AppFlow to sync Salesforce leads into an S3 data lake every hour, applying field mappings and removing PII before storage.



AWS Amplify

AWS Amplify is a development platform for building and deploying full-stack web and mobile applications. It provides:

- Frontend Tooling: A CLI and libraries for integrating authentication (Cognito), APIs (AppSync/GraphQL, REST), and storage (S3) into JavaScript, iOS, and Android apps.
- Hosting & CI/CD: One-click deployment of single-page web apps or static sites with built-in continuous integration and custom domain management.
- Datastore & Offline Support: Local data store with synchronization to the cloud, enabling offline-first experiences.
- Admin UI & Studio: Visual interface for managing backend resources, user authentication flows, and data models without heavy backend coding.

Use Case:
A startup uses Amplify to rapidly build a React web app with user sign-up/sign-in, a GraphQL API, and file storage. They deploy to production via Amplify Console's CI/CD pipeline and manage content models through the Admin UI.

Other Services Exam Questions

Your organization’s infrastructure team wants to adopt an “infrastructure as code” approach, where all AWS resources (VPCs, EC2 instances, RDS databases, IAM roles, etc.) are defined in text files, version-controlled, and deployed automatically. They need a service that can interpret declarative YAML or JSON templates, manage creation and updates in the correct dependency order, detect configuration drift, and roll back changes if stack creation fails. Which AWS service fulfills all these requirements?

A. AWS CloudFormation

B. AWS Elastic Beanstalk

C. AWS OpsWorks

D. AWS CLI

Your marketing team wants to send personalized, multi-channel messages (email, SMS, push notifications) to customers based on their recent purchase behavior. They need built-in analytics to track engagement (opens, clicks), the ability to segment audiences dynamically, and orchestration of follow-up messages as part of a customer journey—all without managing underlying infrastructure. Which AWS service should they choose?

A. Amazon SES

B. Amazon SNS

C. Amazon Pinpoint

D. AWS Step Functions