**Analytics:**

• **Amazon Athena**

[Amazon Athena](https://aws.amazon.com/athena) is an interactive query service that makes it easy to analyze data in Amazon S3 using standard SQL.

Athena is serverless, so there is no infrastructure to manage, and you pay only for the queries that you run.

Athena is easy to use. Simply point to your data in Amazon S3, deﬁne the schema, and start querying using standard SQL. Most results are delivered within seconds.

With Athena, there’s no need for complex extract, transform, and load (ETL) jobs to prepare your data for analysis.

This makes it easy for anyone with SQL skills to quickly analyze large-scale datasets.

Athena is out-of-the-box integrated with AWS Glue Data Catalog, allowing you to create a unified metadata repository across various services, crawl data sources to discover schemas and populate your Catalog with new and modified table and partition definitions, and maintain schema versioning.

**• Amazon Kinesis**

[Amazon Kinesis](https://aws.amazon.com/kinesis/) makes it easy to collect, process, and analyze real-time, streaming data so you can get timely insights and react quickly to new information.

Amazon Kinesis offers key capabilities to cost-effectively process streaming data at any scale, along with the flexibility to choose the tools that best suit the requirements of your application.

With Amazon Kinesis, you can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications.

Amazon Kinesis enables you to process and analyze data as it arrives and respond instantly instead of having to wait until all your data is collected before the processing can begin.

Amazon Kinesis currently oﬀers four services:

Kinesis Data Firehose:  is the easiest way to reliably load streaming data into data stores and analytics tools

Kinesis Data Analytics: is the easiest way to analyze streaming data, gain actionable insights, and respond to your business and customer needs in real time.

Kinesis Data Streams: is a massively scalable and durable real-time data streaming service. KDS can continuously capture gigabytes of data per second from hundreds of thousands of sources

Kinesis Video Streams:  makes it easy to securely stream video from connected devices to AWS for analytics, machine learning (ML), playback, and other processing

**• Amazon QuickSight:**

[Amazon QuickSight](https://quicksight.aws/) is a fast, cloud-powered business intelligence (BI) service that makes it easy for you to deliver insights to everyone in your organization.

QuickSight lets you create and publish interactive dashboards that can be accessed from browsers or mobile devices.

You can embed dashboards into your applications, providing your customers with powerful self-service analytics.

QuickSight easily scales to tens of thousands of users without any software to install, servers to deploy, or infrastructure to manage.

**Application Integration:**

Application integration on AWS is a suite of services that enable communication between decoupled components within micro services, distributed systems, and serverless applications. You don’t need to refactor your entire architecture to benefit - decoupling applications at any scale can reduce the impact of changes, making it easier to update and faster to release new features.

**• Amazon Simple Notification Service (Amazon SNS)**

[Amazon Simple Notification Service (Amazon SNS)](https://aws.amazon.com/sns/) is a highly available, durable, secure, fully managed pub/sub messaging service that enables you to decouple microservices, distributed systems, and serverless applications.

Amazon SNS provides topics for high-throughput, push-based, many-to-many messaging.

Using Amazon SNS topics, your publisher systems can fan out messages to a large number of subscriber endpoints for parallel processing, including Amazon SQS queues, AWS Lambda functions, and HTTP/S webhooks.

Additionally, SNS can be used to fan out notifications to end users using mobile push, SMS, and email.

**• Amazon Simple Queue Service (Amazon SQS)**

[Amazon Simple Queue Service (Amazon SQS)](https://aws.amazon.com/sqs/) is a fully managed message queuing service that enables you to decouple and scale microservices, distributed systems, and serverless applications.

SQS eliminates the complexity and overhead associated with managing and operating message oriented middleware, and empowers developers to focus on differentiating work.

Using SQS, you can send, store, and receive messages between software components at any volume, without losing messages or requiring other services to be available.

Get started with SQS in minutes using the AWS console, Command Line Interface or SDK of your choice, and three simple commands.

SQS offers two types of message queues.

->Standard queues offer maximum throughput, best-effort ordering, and at-least-once delivery.

->SQS FIFO queues are designed to guarantee that messages are processed exactly once, in the exact order that they are sent.

**Compute and Serverless:**

**• AWS Batch**

[AWS Batch](https://aws.amazon.com/batch) enables developers, scientists, and engineers to easily and efficiently run hundreds of thousands of batch computing jobs on AWS.

AWS Batch dynamically provisions the optimal quantity and type of compute resources (e.g., CPU or memory-optimized instances) based on the volume and specific resource requirements of the batch jobs submitted.

With AWS Batch, there is no need to install and manage batch computing software or server clusters that you use to run your jobs, allowing you to focus on analyzing results and solving problems.

AWS Batch plans, schedules, and runs your batch computing workloads across the full range of AWS compute services and features, such as Amazon EC2 and Spot Instances.

**• Amazon EC2**

[Amazon Elastic Compute Cloud (Amazon EC2)](https://aws.amazon.com/ec2/) is a web service that provides secure, resizable compute capacity in the cloud.

It is designed to make web-scale computing easier for developers.

The simple web interface of Amazon EC2 allows you to obtain and configure capacity with minimal friction.

It provides you with complete control of your computing resources and lets you run on Amazon’s proven computing environment.

Amazon EC2 reduces the time required to obtain and boot new server instances (called Amazon EC2 instances) to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change.

Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use.

Amazon EC2 provides developers and system administrators the tools to build failure resilient applications and isolate themselves from common failure scenarios.

### Instance Types

Amazon EC2 passes on to you the financial benefits of Amazon’s scale. You pay a very low rate for the compute capacity you actually consume. See Amazon [EC2](https://aws.amazon.com/ec2/purchasing-options/) [Instance Purchasing Options](https://aws.amazon.com/ec2/purchasing-options/) for a more detailed description.

* **On-Demand Instances**— With On-Demand instances, you pay for compute capacity by the hour or the second depending on which instances you run. No longer-term commitments or upfront payments are needed. You can increase or decrease your compute capacity depending on the demands of your application and only pay the specified per hourly rates for the instance you use. On-Demand instances are recommended for:
  + Users that prefer the low cost and flexibility of Amazon EC2 without any up-front payment or long-term commitment
  + Applications with short-term, spiky, or unpredictable workloads that cannot be interrupted
  + Applications being developed or tested on Amazon EC2 for the first time
* **Spot Instances**—[Spot Instances](https://aws.amazon.com/ec2/purchasing-options/spot-instances/) are available at up to a 90% discount compared to On-Demand prices and let you take advantage of unused Amazon EC2 capacity in the AWS Cloud. You can significantly reduce the cost of running your applications, grow your application’s compute capacity and throughput for the same budget, and enable new types of cloud computing applications. Spot instances are recommended for:

Applications that have flexible start and end times

Applications that are only feasible at very low compute prices

Users with urgent computing needs for large amounts of additional capacity

* **Reserved Instances**—[Reserved Instances](https://aws.amazon.com/ec2/purchasing-options/reserved-instances/) provide you with a significant discount (up to 72%) compared to On-Demand instance pricing. You have the flexibility to change families, operating system types, and tenancies while benefitting from Reserved Instance pricing when you use Convertible Reserved Instances.
* **Savings Plans**—[Savings Plans](http://aws.amazon.com/savingsplans) are a flexible pricing model that offer low prices on EC2 and Fargate usage, in exchange for a commitment to a consistent amount of usage (measured in $/hour) for a 1 or 3 year term.
* **Dedicated Hosts**—A [Dedicated Host](http://aws.amazon.com/ec2/dedicated-hosts/pricing) is a physical EC2 server dedicated for your use. Dedicated Hosts can help you reduce costs by allowing you to use your existing server-bound software licenses, including Windows Server, SQL Server, and SUSE Linux Enterprise Server (subject to your license terms), and can also help you meet compliance requirements.

**Amazon EC2 Auto Scaling**

[Amazon EC2 Auto Scaling](https://aws.amazon.com/ec2/autoscaling/) helps you maintain application availability and allows you to automatically add or remove EC2 instances according to conditions you define.

You can use the fleet management features of Amazon EC2 Auto Scaling to maintain the health and availability of your fleet.

You can also use the dynamic and predictive scaling features of Amazon EC2 Auto Scaling to add or remove EC2 instances.

Dynamic scaling responds to changing demand

predictive scaling automatically schedules the right number of EC2 instances based on predicted demand.

Dynamic scaling and predictive scaling can be used together to scale faster.

**Amazon EC2 Image Builder**

[EC2 Image Builder](http://aws.amazon.com/image-builder) simplifies the building, testing, and deployment of Virtual Machine and container images for use on AWS or on-premises.

Keeping Virtual Machine and container images up-to-date can be time consuming, resource intensive, and error-prone. Currently, customers either manually update and snapshot VMs or have teams that build automation scripts to maintain images.

Image Builder significantly reduces the effort of keeping images up-to-date and secure by providing a simple graphical interface, built-in automation, and AWS-provided security settings.

With Image Builder, there are no manual steps for updating an image nor do you have to build your own automation pipeline.

Image Builder is offered at no cost, other than the cost of the underlying AWS resources used to create, store, and share the images.

**• AWS Elastic Beanstalk**

[AWS Elastic Beanstalk](https://aws.amazon.com/elasticbeanstalk/) is an easy-to-use service for deploying and scaling web applications and services developed with Java, .NET, PHP, Node.js, Python, Ruby, Go, and Docker on familiar servers such as Apache, Nginx, Passenger, and Internet Information Services (IIS).

You can simply upload your code

AWS Elastic Beanstalk automatically handles the deployment, from capacity provisioning, load balancing, and auto scaling to application health monitoring.

At the same time, you retain full control over the AWS resources powering your application and can access the underlying resources at any time.

**• AWS Lambda**

[AWS Lambda](https://aws.amazon.com/lambda/) lets you run code without provisioning or managing servers.

You pay only for the compute time you consume there is no charge when your code is not running.

With Lambda, you can run code for virtually any type of application or backend service all with zero administration.

Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability.

You can set up your code to automatically trigger from other AWS services, or you can call it directly from any web or mobile app.

**• Amazon Lightsail**

[Amazon Lightsail](https://amazonlightsail.com/) is designed to be the easiest way to launch and manage a virtual private server with AWS.

Lightsail plans include everything you need to jumpstart your project a virtual machine, SSD-based storage, data transfer, DNS management, and a static IP address for a low, predictable price.

**• Amazon WorkSpaces**

Amazon WorkSpaces is a managed, secure Desktop-as-a-Service (DaaS) solution.

You can use Amazon WorkSpaces to provision either Windows or Linux desktops in just a few minutes and quickly scale to provide thousands of desktops to workers across the globe.

You can pay either monthly or hourly, just for the WorkSpaces you launch, which helps you save money when compared to traditional desktops and on-premises VDI solutions.

Amazon WorkSpaces helps you eliminate the complexity in managing hardware inventory, OS versions and patches, and Virtual Desktop Infrastructure (VDI), which helps simplify your desktop delivery strategy.

With Amazon WorkSpaces, your users get a fast, responsive desktop of their choice that they can access anywhere, anytime, from any supported device.

**Containers:**

**• Amazon Elastic Container Service (Amazon ECS)**

[Amazon Elastic Container Service (Amazon ECS)](https://aws.amazon.com/ecs/) is a highly scalable, high-performance container orchestration service that supports Docker containers and allows you to easily run and scale containerized applications on AWS.

Amazon ECS eliminates the need for you to install and operate your own container orchestration software, manage and scale a cluster of virtual machines, or schedule containers on those virtual machines.

With simple API calls, you can launch and stop Docker-enabled applications, query the complete state of your application, and access many familiar features such as IAM roles, security groups, load balancers, Amazon CloudWatch Events, AWS CloudFormation templates, and AWS CloudTrail logs.

**• Amazon Elastic Kubernetes Service (Amazon EKS)**

[Amazon Elastic Kubernetes Service (Amazon EKS)](https://aws.amazon.com/eks/) makes it easy to deploy, manage, and scale containerized applications using Kubernetes on AWS.

Amazon EKS runs the Kubernetes management infrastructure for you across multiple AWS availability zones to eliminate a single point of failure.

Amazon EKS is certified Kubernetes conformant so you can use existing tooling and plugins from partners and the Kubernetes community.

Applications running on any standard Kubernetes environment are fully compatible and can be easily migrated to Amazon EKS.

**• AWS Fargate**

[AWS Fargate](https://aws.amazon.com/fargate/) is a compute engine for Amazon ECS that allows you to run [containers](https://aws.amazon.com/containers/) without having to manage servers or clusters.

With AWS Fargate, you no longer have to provision, configure, and scale clusters of virtual machines to run containers.

This removes the need to choose server types, decide when to scale your clusters, or optimize cluster packing.

AWS Fargate removes the need for you to interact with or think about servers or clusters. Fargate lets you focus on designing and building your applications instead of managing the infrastructure that runs them.

Amazon ECS has two modes: Fargate launch type and EC2 launch type.

With Fargate launch type, all you have to do is package your application in containers, specify the CPU and memory requirements, define networking and IAM policies, and launch the application.

EC2 launch type allows you to have server-level, more granular control over the infrastructure that runs your container applications.

With EC2 launch type, you can use Amazon ECS to manage a cluster of servers and schedule placement of containers on the servers.

Amazon ECS keeps track of all the CPU, memory and other resources in your cluster, and also finds the best server for a container to run on based on your specified resource requirements.

You are responsible for provisioning, patching, and scaling clusters of servers.

You can decide which type of server to use, which applications and how many containers to run in a cluster to optimize utilization, and when you should add or remove servers from a cluster.

EC2 launch type gives you more control of your server clusters and provides a broader range of customization options, which might be required to support some specific applications or possible compliance and government requirements.

**Database:**

**• Amazon Aurora**

[Amazon Aurora](https://aws.amazon.com/rds/aurora/) is a MySQL and PostgreSQL compatible relational database engine that combines the speed and availability of high-end commercial databases with the simplicity and cost-eﬀectiveness of open source databases.

Amazon Aurora is up to five times faster than standard MySQL databases and three times faster than standard PostgreSQL databases. It provides the security, availability, and reliability of commercial databases at 1/10th the cost. Amazon Aurora is fully managed by Amazon Relational Database Service (Amazon RDS), which automates time-consuming administration tasks like hardware provisioning, database setup, patching, and backups.

Amazon Aurora features a distributed, fault-tolerant, self-healing storage system that auto-scales up to 128TB per database instance.

It delivers high performance and availability with up to 15 low-latency read replicas, point-in-time recovery, continuous backup to Amazon S3, and replication across three Availability Zones (AZs).

**• Amazon DynamoDB**

[Amazon DynamoDB](https://aws.amazon.com/dynamodb/) is a key-value and document database that delivers single-digit millisecond performance at any scale.

It's a fully managed, multiregion, multimaster database with built-in security, backup and restore, and in-memory caching for internet-scale applications.

DynamoDB can handle more than 10 trillion requests per day and support peaks of more than 20 million requests per second.

Many of the world's fastest growing businesses such as Lyft, Airbnb, and Redfin as well as enterprises such as Samsung, Toyota, and Capital One depend on the scale and performance of DynamoDB to support their mission-critical workloads.

Hundreds of thousands of AWS customers have chosen DynamoDB as their key-value and document database for mobile, web, gaming, ad tech, IoT, and other applications that need low-latency data access at any scale. Create a new table for your application and let DynamoDB handle the rest.

**• Amazon ElastiCache**

[Amazon ElastiCache](https://aws.amazon.com/elasticache/) is a web service that makes it easy to deploy, operate, and scale an in-memory cache in the cloud.

The service improves the performance of web applications by allowing you to retrieve information from fast, managed, in-memory caches, instead of relying entirely on slower disk-based databases.

Amazon ElastiCache supports two open-source in-memory caching engines:

* [Redis](https://aws.amazon.com/redis/) - a fast, open-source, in-memory key-value data store for use as a database, cache, message broker, and queue.
* [Amazon ElastiCache for Redis](https://aws.amazon.com/elasticache/redis/) is a Redis-compatible in-memory service that delivers the ease-of-use and power of Redis along with the availability, reliability, and performance suitable for the most demanding applications.
* Both single-node and up to 15-shard clusters are available, enabling scalability to up to 3.55 TiB of in-memory data. ElastiCache for Redis is fully managed, scalable, and secure. This makes it an ideal candidate to power high-performance use cases such as web, mobile apps, gaming, ad-tech, and IoT.
* [Memcached](https://aws.amazon.com/memcached/) - a widely adopted memory object caching system.
* [ElastiCache for Memcached](https://aws.amazon.com/elasticache/memcached/) is protocol compliant with Memcached, so popular tools that you use today with existing Memcached environments will work seamlessly with the service.

**• Amazon RDS**

[Amazon Relational Database Service (Amazon RDS)](https://aws.amazon.com/rds/) makes it easy to set up, operate, and scale a relational database in the cloud.

It provides cost-efficient and resizable capacity while automating time-consuming administration tasks such as hardware provisioning, database setup, patching and backups.

It frees you to focus on your applications so you can give them the fast performance, high availability, security and compatibility they need.

Amazon RDS is available on several database instance types - optimized for memory, performance or I/O - and provides you with six familiar database engines to choose from, including [Amazon Aurora](https://aws.amazon.com/aurora/), [PostgreSQL](https://aws.amazon.com/rds/postgresql/), [MySQL](https://aws.amazon.com/rds/mysql), [MariaDB](https://aws.amazon.com/rds/mariadb" \t "_blank), [Oracle Database](https://aws.amazon.com/rds/oracle), and [SQL Server](https://aws.amazon.com/rds/sqlserver). You can use the [AWS Database Migration Service](https://aws.amazon.com/dms/) to easily migrate or replicate your existing databases to Amazon RDS.

[Amazon Relational Database Service (Amazon RDS)](https://aws.amazon.com/rds/vmware) on VMware lets you deploy managed databases in on-premises VMware environments using the Amazon RDS technology enjoyed by hundreds of thousands of AWS customers.

**• Amazon Redshift**

Amazon Redshift is a fully managed, petabyte-scale data warehouse service in the cloud.

You can start with just a few hundred gigabytes of data and scale to a petabyte or more.

This enables you to use your data to acquire new insights for your business and customers.

The first step to create a data warehouse is to launch a set of nodes, called an Amazon Redshift cluster. After you provision your cluster, you can upload your data set and then perform data analysis queries. Regardless of the size of the data set, Amazon Redshift offers fast query performance using the same SQL-based tools and business intelligence applications that you use today.

If you are a first-time user of Amazon Redshift, we recommend that you begin by reading the following sections:

* [Amazon Redshift management overview](https://docs.aws.amazon.com/redshift/latest/mgmt/overview.html) – This topic provides an overview of Amazon Redshift.
* [Service Highlights and Pricing](https://aws.amazon.com/redshift/) – This product detail page provides the Amazon Redshift value proposition, service highlights, and pricing.
* [Amazon Redshift Getting Started Guide](https://docs.aws.amazon.com/redshift/latest/gsg/) – This guide walks you through the process of creating a cluster, creating database tables, uploading data, and testing queries.
* [Amazon Redshift Cluster Management Guide](https://docs.aws.amazon.com/redshift/latest/mgmt/) (this guide) – This guide shows you how to create and manage Amazon Redshift clusters.
* [Amazon Redshift Database Developer Guide](https://docs.aws.amazon.com/redshift/latest/dg/) – If you are a database developer, this guide explains how to design, build, query, and maintain the databases that make up your data warehouse.

There are several ways to manage clusters. If you prefer a more interactive way of managing clusters, you can use the Amazon Redshift console or the AWS Command Line Interface (AWS CLI). If you are an application developer, you can use the Amazon Redshift Query API or the AWS Software Development Kit (SDK) libraries to manage clusters programmatically. If you use the Amazon Redshift Query API, you must authenticate every HTTP or HTTPS request to the API by signing it. For more information about signing requests, go to [Signing an HTTP request](https://docs.aws.amazon.com/redshift/latest/mgmt/amazon-redshift-signing-requests.html).

**Developer Tools:**

**• AWS CodeBuild**

[AWS CodeBuild](https://aws.amazon.com/codebuild) is a fully managed build service that compiles source code, runs tests, and produces software packages that are ready to deploy.

With CodeBuild, you don’t need to provision, manage, and scale your own build servers. CodeBuild scales continuously and processes multiple builds concurrently, so your builds are not left waiting in a queue.

You can get started quickly by using prepackaged build environments, or you can create custom build environments that use your own build tools.

**• AWS CodeCommit**

[AWS CodeCommit](https://aws.amazon.com/codecommit/) is a fully managed source control service that makes it easy for companies to host secure and highly scalable private Git repositories.

AWS CodeCommit eliminates the need to operate your own source control system or worry about scaling its infrastructure.

You can use AWS CodeCommit to securely store anything from source code to binaries, and it works seamlessly with your existing Git tools.

**• AWS CodeDeploy**

[AWS CodeDeploy](https://aws.amazon.com/codedeploy/) is a service that automates code deployments to any instance, including EC2 instances and instances running on premises.

CodeDeploy makes it easier for you to rapidly release new features, helps you avoid downtime during application deployment, and handles the complexity of updating your applications.

You can use CodeDeploy to automate software deployments, eliminating the need for error-prone manual operations.

The service scales with your infrastructure so you can easily deploy to one instance or thousands.

**• AWS CodePipeline**

[AWS CodePipeline](https://aws.amazon.com/codepipeline/) is a fully managed continuous delivery service that helps you automate your release pipelines for fast and reliable application and infrastructure updates.

CodePipeline automates the build, test, and deploy phases of your release process every time there is a code change, based on the release model you define.

This enables you to rapidly and reliably deliver features and updates.

You can easily integrate CodePipeline with third-party services such as GitHub or with your own custom plugin. With AWS CodePipeline, you only pay for what you use. There are no upfront fees or long-term commitments.

**• AWS CodeStar**

[AWS CodeStar](https://aws.amazon.com/codestar/) enables you to quickly develop, build, and deploy applications on AWS.

AWS CodeStar provides a unified user interface, enabling you to easily manage your software development activities in one place.

With AWS CodeStar, you can set up your entire continuous delivery toolchain in minutes, allowing you to start releasing code faster.

AWS CodeStar makes it easy for your whole team to work together securely, allowing you to easily manage access and add owners, contributors, and viewers to your projects.

Each AWS CodeStar project comes with a project management dashboard, including an integrated issue tracking capability powered by Atlassian JIRA Software.

With the AWS CodeStar project dashboard, you can easily track progress across your entire software development process, from your backlog of work items to teams’ recent code deployments.

For more information, see [AWS CodeStar features](https://aws.amazon.com/codestar/features/)

## Project templates

## Team access management

## Hosted Git repository

## Fully managed build service

## Automated continuous delivery pipeline

## Automated deployments

## IDE integrations

## Central project dashboard

**Customer Engagement:** Engage your customers throughout their lifecycle

**• Amazon Connect**

Amazon Connect is an easy to use omnichannel cloud contact center that helps you provide superior customer service at a lower cost.

In just a few clicks, you can set up and make changes to your contact center, so agents can begin helping customers right away.

Save up to 80% compared to traditional contact center solutions with no minimum fees, long-term commitments, or upfront license charges.

Easily scale up or down to meet demand, with the flexibility to onboard tens of thousands of agents working from anywhere.

**Management, Monitoring, and Governance:**

**• AWS Auto Scaling**

[AWS Auto Scaling](https://aws.amazon.com/autoscaling/) monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost.

Using AWS Auto Scaling, it’s easy to setup application scaling for multiple resources across multiple services in minutes.

The service provides a simple, powerful user interface that lets you build scaling plans for resources including [Amazon EC2](https://aws.amazon.com/ec2/) instances and Spot Fleets, [Amazon ECS](https://aws.amazon.com/ecs/) tasks, [Amazon DynamoDB](https://aws.amazon.com/dynamodb/) tables and indexes, and [Amazon Aurora](https://aws.amazon.com/rds/aurora/) Replicas.

AWS Auto Scaling makes scaling simple with recommendations that allow you to optimize performance, costs, or balance between them.

If you’re already using [Amazon EC2 Auto Scaling](https://aws.amazon.com/ec2/autoscaling/) to dynamically scale your Amazon EC2 instances, you can now combine it with AWS Auto Scaling to scale additional resources for other AWS services.

With AWS Auto Scaling, your applications always have the right resources at the right time.

**• AWS Budgets**

AWS Budgets allows you to set custom budgets to track your cost and usage from the simplest to the most complex use cases.

With AWS Budgets, you can choose to be alerted by email or SNS notification when actual or forecasted cost and usage exceed your budget threshold, or when your actual RI and Savings Plans' utilization or coverage drops below your desired threshold.

With AWS Budget Actions, you can also configure specific actions to respond to cost and usage status in your accounts, so that if your cost or usage exceeds or is forecasted to exceed your threshold, actions can be executed automatically or with your approval to reduce unintentional over-spending.

AWS Budgets integrates with multiple other AWS services, such as

AWS Cost Explorer, so you can easily view and analyze your cost and usage drivers,

AWS Chatbot, so you can receive Budget alerts in your designated Slack channel or Amazon Chime room, and

AWS Service Catalog, so you can track cost on your approved AWS portfolios and products.

**• AWS CloudFormation**

[AWS CloudFormation](https://aws.amazon.com/cloudformation/) gives developers and systems administrators an easy way to create and manage a collection of related AWS resources, provisioning and updating them in an orderly and predictable fashion.

You can use the AWS CloudFormation [sample templates](https://aws.amazon.com/cloudformation/aws-cloudformation-templates/) or create your own templates to describe your AWS resources, and any associated dependencies or runtime parameters, required to run your application.

You don’t need to figure out the order for provisioning AWS services or the subtleties of making those dependencies work. CloudFormation takes care of this for you.

After the AWS resources are deployed, you can modify and update them in a controlled and predictable way, in effect applying version control to your AWS infrastructure the same way you do with your software.

You can also visualize your templates as diagrams and edit them using a drag-and-drop interface with the [AWS CloudFormation Designer](https://aws.amazon.com/cloudformation/details/#designer).

**• AWS CloudTrail**

With AWS CloudTrail, you can monitor your AWS deployments in the cloud by getting a history of AWS API calls for your account, including API calls made by using the AWS Management Console, the AWS SDKs, the command line tools, and higher-level AWS services.

You can also identify which users and accounts called AWS APIs for services that support CloudTrail, the source IP address from which the calls were made, and when the calls occurred.

You can integrate CloudTrail into applications using the API, automate trail creation for your organization, check the status of your trails, and control how administrators turn CloudTrail logging on and off.

**• Amazon CloudWatch**

Amazon CloudWatch is a monitoring and observability service built for DevOps engineers, developers, site reliability engineers (SREs), and IT managers.

CloudWatch provides you with data and actionable insights to monitor your applications, respond to system-wide performance changes, optimize resource utilization, and get a unified view of operational health.

CloudWatch collects monitoring and operational data in the form of logs, metrics, and events, providing you with a unified view of AWS resources, applications, and services that run on AWS and on-premises servers.

You can use CloudWatch to detect anomalous behavior in your environments, set alarms, visualize logs and metrics side by side, take automated actions, troubleshoot issues, and discover insights to keep your applications running smoothly.

**• AWS Config**

AWS Config is a service that enables you to assess, audit, and evaluate the configurations of your AWS resources.

Config continuously monitors and records your AWS resource configurations and allows you to automate the evaluation of recorded configurations against desired configurations.

With Config, you can review changes in configurations and relationships between AWS resources, dive into detailed resource configuration histories, and determine your overall compliance against the configurations specified in your internal guidelines. This enables you to simplify compliance auditing, security analysis, change management, and operational troubleshooting.

**• AWS Cost and Usage Report**

The AWS Cost & Usage Report contains the most comprehensive set of AWS cost and usage data available, including additional metadata about AWS services, pricing, credit, fees, taxes, discounts, cost categories, Reserved Instances, and Savings Plans.

The AWS Cost & Usage Report (CUR) itemizes usage at the account or Organization level by product code, usage type and operation.

These costs can be further organized by Cost Allocation tags and Cost Categories.

The AWS Cost & Usage Report is available at an hourly, daily, or monthly level of granularity, as well as at the management or member account level.

With the right access, users can access CUR at management and member account level, which saves management account holders from having to generate CUR reports for member accounts.

**• Amazon EventBridge (Amazon CloudWatch Events)**

Amazon EventBridge is a serverless event bus that makes it easier to build event-driven applications at scale using events generated from your applications, integrated Software-as-a-Service (SaaS) applications, and AWS services.

EventBridge delivers a stream of real-time data from event sources such as Zendesk or Shopify to targets like AWS Lambda and other SaaS applications.

You can set up routing rules to determine where to send your data to build application architectures that react in real-time to your data sources with event publisher and consumer completely decoupled.

**• AWS License Manager**

AWS License Manager makes it easier to manage your software licenses from vendors such as Microsoft, SAP, Oracle, and IBM across AWS and on-premises environments.

AWS License Manager lets administrators create customized licensing rules that mirror the terms of their licensing agreements.

Administrators can use these rules to help prevent licensing violations, such as using more licenses than an agreement stipulates.

Rules in AWS License Manager help prevent a licensing breach by stopping the instance from launching or by notifying administrators about the infringement.

Administrators gain control and visibility of all their licenses with the AWS License Manager dashboard and reduce the risk of non-compliance, misreporting, and additional costs due to licensing overages.

Independent software vendors (ISVs) can also use AWS License Manager to easily distribute and track licenses.

AWS License Manager also simplifies the management of your software licenses that require Amazon EC2 Dedicated Hosts.

In AWS License Manager, administrators can specify their Dedicated Host management preferences for host allocation and host capacity utilization.

Once set up, AWS License Manager takes care of these administrative tasks on your behalf, so that you can seamlessly launch instances just like you would launch an EC2 instance with AWS provided licenses.  
  
AWS License Manager is offered at no additional charge. You only pay for AWS resources you use to run your applications. Visit the [AWS License Manager](https://console.aws.amazon.com/license-manager/) console to start managing your licenses.

**• AWS Managed Services**

AWS Managed Services (AMS) helps you operate your AWS infrastructure more efficiently and securely.

Leveraging AWS services and a growing library of automations, configurations, and run books, AMS can augment and optimize your operational capabilities in both new and existing AWS environments.

Whether customers are just getting started, migrating a data center, or building optimized solutions in the cloud, ongoing operational excellence is a critical component to success in the cloud.

AMS can help augment your cloud operations skills and experience as a short term accelerator or long term solution; letting you focus on transforming your applications and business in the cloud.

AMS provides you operational flexibility, enhances security and compliance, and will help you optimize capacity and take action on identified cost savings.

AMS provides a consistent operating model for your entire AWS fleet leveraging detective guardrails, monitoring, security, and incident management best practices for both traditional and modernized workloads.

**• AWS Organizations**

AWS Organizations helps you centrally manage and govern your environment as you grow and scale your AWS resources.

Using AWS Organizations, you can programmatically create new AWS accounts and allocate resources, group accounts to organize your workflows, apply policies to accounts or groups for governance, and simplify billing by using a single payment method for all of your accounts.

In addition, AWS Organizations is integrated with other AWS services so you can define central configurations, security mechanisms, audit requirements, and resource sharing across accounts in your organization. AWS Organizations is available to all AWS customers at no additional charge.

**• AWS Secrets Manager**

AWS Secrets Manager helps you protect secrets needed to access your applications, services, and IT resources.

The service enables you to easily rotate, manage, and retrieve database credentials, API keys, and other secrets throughout their lifecycle.

Users and applications retrieve secrets with a call to Secrets Manager APIs, eliminating the need to hardcode sensitive information in plain text.

Secrets Manager offers secret rotation with built-in integration for Amazon RDS, Amazon Redshift, and Amazon DocumentDB.

Also, the service is extensible to other types of secrets, including API keys and OAuth tokens.

In addition, Secrets Manager enables you to control access to secrets using fine-grained permissions and audit secret rotation centrally for resources in the AWS Cloud, third-party services, and on-premises.

**• AWS Systems Manager**

AWS Systems Manager is the operations hub for AWS.

Systems Manager provides a unified user interface so you can track and resolve operational issues across your AWS applications and resources from a central place.

With Systems Manager, you can automate operational tasks for Amazon EC2 instances or Amazon RDS instances.

You can also group resources by application, view operational data for monitoring and troubleshooting, implement pre-approved change work flows, and audit operational changes for your groups of resources.

Systems Manager simplifies resource and application management, shortens the time to detect and resolve operational problems, and makes it easier to operate and manage your infrastructure at scale.

**• AWS Systems Manager Parameter Store**

Parameter Store, a capability of AWS Systems Manager, provides secure, hierarchical storage for configuration data management and secrets management.

You can store data such as passwords, database strings, Amazon Machine Image (AMI) IDs, and license codes as parameter values.

You can store values as plain text or encrypted data.

You can reference Systems Manager parameters in your scripts, commands, SSM documents, and configuration and automation workflows by using the unique name that you specified when you created the parameter.

Parameter Store is also integrated with Secrets Manager. You can retrieve Secrets Manager secrets when using other AWS services that already support references to Parameter Store parameters.

**• AWS Trusted Advisor**

AWS Trusted Advisors provides recommendations that help you follow AWS best practices.

Trusted Advisor evaluates your account by using checks.

These checks identify ways to optimize your AWS infrastructure, improve security and performance, reduce costs, and monitor service quotas.

You can then follow the check recommendations to optimize your services and resources.

AWS Basic Support and [AWS Developer Support](https://aws.amazon.com/premiumsupport/plans/developers/) customers can access core security checks and all checks for service quotas.

[AWS Business Support](https://aws.amazon.com/premiumsupport/plans/business/) and [AWS Enterprise Support](https://aws.amazon.com/premiumsupport/plans/enterprise/) customers can access all checks, including cost optimization, security, fault tolerance, performance, and service quotas.

For a complete list of checks and descriptions, see the [Trusted Advisor Best Practices](https://aws.amazon.com/premiumsupport/technology/trusted-advisor/best-practice-checklist/).



**Networking and Content Delivery:**

**• Amazon API Gateway**

Amazon API Gateway is a fully managed service that makes it easy for developers to create, publish, maintain, monitor, and secure APIs at any scale.

APIs act as the "front door" for applications to access data, business logic, or functionality from your backend services.

Using API Gateway, you can create RESTful APIs and WebSocket APIs that enable real-time two-way communication applications.

API Gateway supports containerized and serverless workloads, as well as web applications.

API Gateway handles all the tasks involved in accepting and processing up to hundreds of thousands of concurrent API calls, including traffic management, CORS support, authorization and access control, throttling, monitoring, and API version management.

API Gateway has no minimum fees or startup costs. You pay for the API calls you receive and the amount of data transferred out and, with the API Gateway tiered pricing model, you can reduce your cost as your API usage scales.

**• Amazon CloudFront**

Amazon CloudFront is a fast content delivery network (CDN) service that securely delivers data, videos, applications, and APIs to customers globally with low latency, high transfer speeds, all within a developer-friendly environment.

CloudFront offers the most advanced security capabilities, including field level encryption and HTTPS support, seamlessly integrated with [AWS Shield](https://aws.amazon.com/shield/), [AWS Web Application Firewall](https://aws.amazon.com/waf/) and [Amazon Route 53](https://aws.amazon.com/route53/) to protect against multiple types of attacks including network and application layer DDoS attacks.

These services co-reside at edge networking locations – globally scaled and connected via the AWS network backbone – providing a more secure, performant, and available experience for your users.

CloudFront works seamlessly with any AWS origin, such as [Amazon S3](https://aws.amazon.com/s3/), [Amazon EC2](https://aws.amazon.com/ec2/), [Elastic Load Balancing](https://aws.amazon.com/elasticloadbalancing/), or with any custom HTTP origin.

You can customize your content delivery through CloudFront using the secure and programmable edge computing features CloudFront Functions and [AWS Lambda@Edge](https://aws.amazon.com/lambda/edge/).

**• AWS Direct Connect**

AWS Direct Connect is a cloud service solution that makes it easy to establish a dedicated network connection from your premises to AWS.

Using AWS Direct Connect, you create a private connection between AWS and your data center, office, or colocation environment.

This can increase bandwidth throughput and provide a more consistent network experience than internet-based connections.

AWS Direct Connect is compatible with all AWS services accessible over the internet, and is available in speeds starting at 50 Mbps and scaling up to 100 Gbps.

**• Amazon Route 53**

Amazon Route 53 is a highly available and scalable cloud [Domain Name System (DNS)](https://aws.amazon.com/route53/what-is-dns/) web service.

It is designed to give developers and businesses an extremely reliable and cost effective way to route end users to Internet applications by translating names like www.example.com into the numeric IP addresses like 192.0.2.1 that computers use to connect to each other.

Amazon Route 53 is fully compliant with IPv6 as well.

Amazon Route 53 effectively connects user requests to infrastructure running in AWS – such as Amazon EC2 instances, Elastic Load Balancing load balancers, or Amazon S3 buckets – and can also be used to route users to infrastructure outside of AWS.

You can use Amazon Route 53 to configure DNS health checks, then continuously monitor your applications’ ability to recover from failures and control application recovery with [Route 53 Application Recovery Controller](https://aws.amazon.com/route53/application-recovery-controller/).

Amazon Route 53 Traffic Flow makes it easy for you to manage traffic globally through a variety of routing types, including Latency Based Routing, Geo DNS, Geoproximity, and Weighted Round Robin—all of which can be combined with DNS Failover in order to enable a variety of low-latency, fault-tolerant architectures. Using Amazon Route 53 Traffic Flow’s simple visual editor, you can easily manage how your end-users are routed to your application’s endpoints—whether in a single AWS region or distributed around the globe.

Amazon Route 53 also offers Domain Name Registration – you can purchase and manage domain names such as example.com and Amazon Route 53 will automatically configure DNS settings for your domains.

**• Amazon VPC**

Amazon Virtual Private Cloud (Amazon VPC) enables you to launch AWS resources into a virtual network that you've defined.

This virtual network closely resembles a traditional network that you'd operate in your own data center, with the benefits of using the scalable infrastructure of AWS.

Amazon Virtual Private Cloud (VPC) gives you complete control over your virtual networking environment, including resource placement, connectivity, and security.

* The first step is to create your VPC.
* Then you can add resources to it, such as Amazon Elastic Compute Cloud (EC2) and Amazon Relational Database Service (RDS) instances.
* Finally, you can define how your VPCs communicate with each other across accounts, Availability Zones (AZs), or Regions.
* In the example below, network traffic is shared between two VPCs within each region.



Secure and monitor connections, screen traffic, and restrict instance access inside your virtual network.

Spend less time setting up, managing, and validating your virtual network, and concentrate on building the applications that run within it.

Customize your virtual networking environment by choosing your own IP address range, creating subnets, and configuring route tables.

**Security, Identity, and Compliance:**

**• AWS Artifact**

AWS Artifact is your go-to, central resource for compliance-related information that matters to you.

It provides on-demand access to AWS’ security and compliance reports and select online agreements.

Reports available in AWS Artifact include our Service Organization Control (SOC) reports, Payment Card Industry (PCI) reports, and certifications from accreditation bodies across geographies and compliance verticals that validate the implementation and operating effectiveness of AWS security controls.

Agreements available in AWS Artifact include the Business Associate Addendum (BAA) and the Nondisclosure Agreement (NDA).

AWS Artifact Reports provides several compliance reports from third-party auditors who have tested and verified our compliance with a variety of global, regional, and industry specific security standards and regulations.

When new reports are released, they are made available in AWS Artifact.

**• AWS Certificate Manager (ACM)**

AWS Certificate Manager is a service that lets you easily provision, manage, and deploy public and private Secure Sockets Layer/Transport Layer Security (SSL/TLS) certificates for use with AWS services and your internal connected resources.

SSL/TLS certificates are used to secure network communications and establish the identity of websites over the Internet as well as resources on private networks.

AWS Certificate Manager removes the time-consuming manual process of purchasing, uploading, and renewing SSL/TLS certificates.

With AWS Certificate Manager, you can quickly request a certificate, deploy it on ACM-integrated AWS resources, such as Elastic Load Balancers, Amazon CloudFront distributions, and APIs on API Gateway, and let AWS Certificate Manager handle certificate renewals.

It also enables you to create private certificates for your internal resources and manage the certificate lifecycle centrally.

Public and private certificates provisioned through AWS Certificate Manager for use with ACM-integrated services are free.

You pay only for the AWS resources you create to run your application.

With [AWS Certificate Manager Private Certificate Authority](https://aws.amazon.com/certificate-manager/private-certificate-authority/), you pay monthly for the operation of the private CA and for the private certificates you issue.

**• AWS CloudHSM**

AWS CloudHSM is a cloud-based hardware security module (HSM) that enables you to easily generate and use your own encryption keys on the AWS Cloud.

With CloudHSM, you can manage your own encryption keys using FIPS 140-2 Level 3 validated HSMs.

CloudHSM offers you the flexibility to integrate with your applications using industry-standard APIs, such as PKCS#11, Java Cryptography Extensions (JCE), and Microsoft CryptoNG (CNG) libraries.

CloudHSM is standards-compliant and enables you to export all of your keys to most other commercially-available HSMs, subject to your configurations.

It is a fully-managed service that automates time-consuming administrative tasks for you, such as hardware provisioning, software patching, high-availability, and backups.

CloudHSM also enables you to scale quickly by adding and removing HSM capacity on-demand, with no up-front costs.

**• Amazon Cognito**

Amazon Cognito lets you add user sign-up, sign-in, and access control to your web and mobile apps quickly and easily.

Amazon Cognito scales to millions of users and supports sign-in with social identity providers, such as Apple, Facebook, Google, and Amazon, and enterprise identity providers via SAML 2.0 and OpenID Connect.

The two main components of Amazon Cognito are user pools and identity pools.

User pools are user directories that provide sign-up and sign-in options for your app users.

Identity pools enable you to grant your users access to other AWS services.

You can use identity pools and user pools separately or together.

**An Amazon Cognito user pool and identity pool used together**

See the diagram for a common Amazon Cognito scenario. Here the goal is to authenticate your user, and then grant your user access to another AWS service.

1. In the first step your app user signs in through a user pool and receives user pool tokens after a successful authentication.
2. Next, your app exchanges the user pool tokens for AWS credentials through an identity pool.
3. Finally, your app user can then use those AWS credentials to access other AWS services such as Amazon S3 or DynamoDB.


      Amazon Cognito overview
    

For more examples using identity pools and user pools, see [Common Amazon Cognito Scenarios](https://docs.aws.amazon.com/cognito/latest/developerguide/cognito-scenarios.html).

Amazon Cognito is compliant with SOC 1-3, PCI DSS, ISO 27001, and is HIPAA-BAA eligible

**• Amazon Detective**

**• Amazon GuardDuty**

**• AWS Identity and Access Management (IAM)**

**• Amazon Inspector**

**• AWS License Manager**

**• Amazon Macie**

**• AWS Shield**

**• AWS WAF**