AWS-BASICS

CLOUD & CLOUD COMPUTING

WHAT IS CLOUD

Cloud

Cloud is a term used to describe globally available storage and computing resources. Essentially, it provides a remote and virtualized infrastructure.

Cloud Computing

In general, cloud computing is a "Methodology that enables highly available and quickly scalable resources."

The Gartner definition

"Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies."

The National Institute of Standards and Technology (NIST) definition

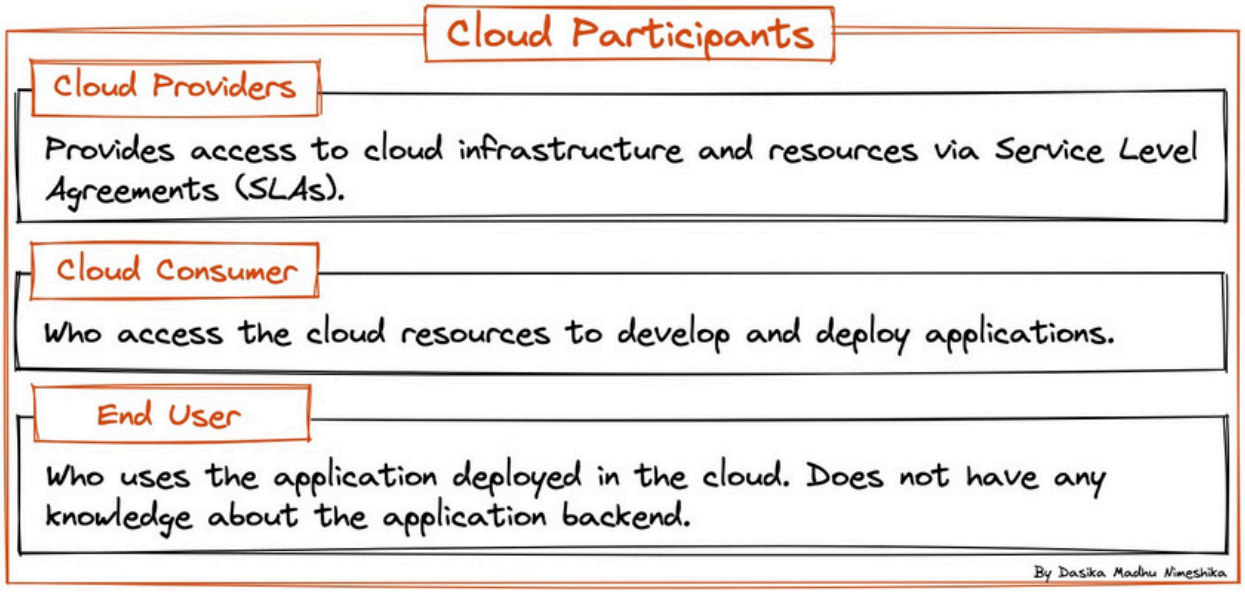
"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

My understanding of Cloud

A computing methodology that provides services to provision and deliver resources via the Internet. It helps in reducing infrastructure management, cost reduction and makes application development and maintenance easy.

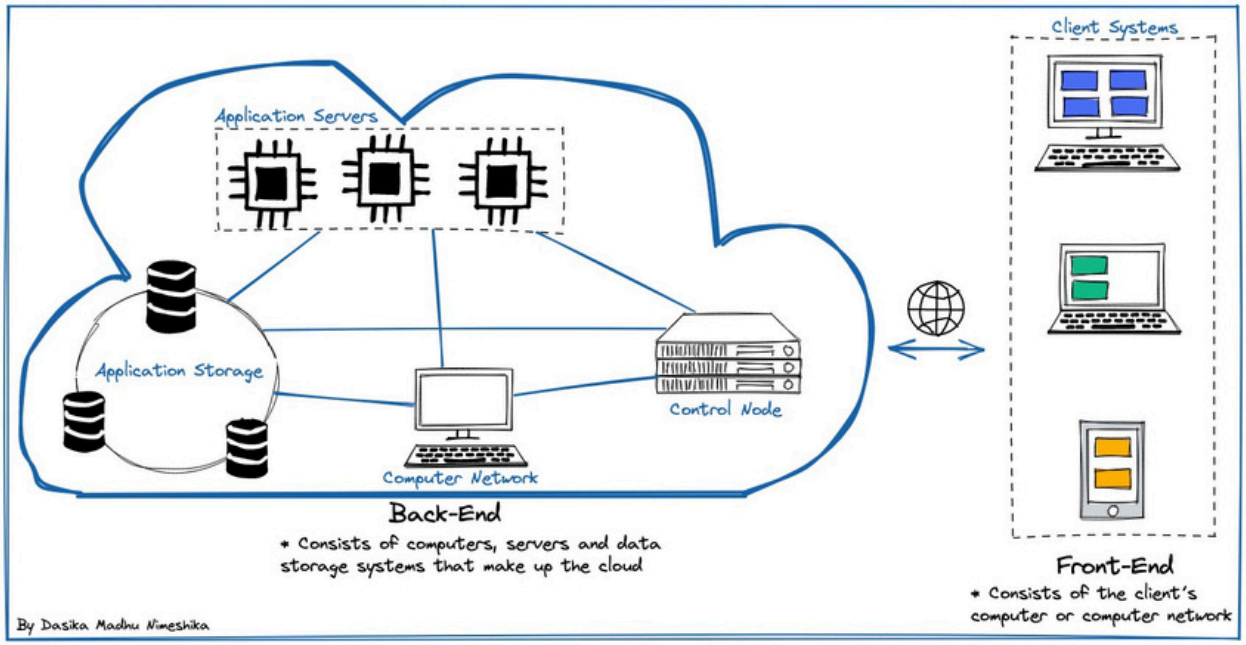
By Dasika Madhu Nimeshika

CLOUD PARTICIPANTS



HOW CLOUD WORKS

- The back-end is provided by the Cloud Provider - offersservices such as storage, compute, database, traffic control mechanisms,and security postures.
- The front-end consists of the client systems whichcan access the cloud resources from anywhere globally.



ON-PREMISE V/S CLOUD

On-Premises	Cloud
Enterprise resources such as storage, compute, databases and more are physically available within the organization boundaries.	Enterprise resources such as storage, compute, databases and more are provided by a Cloud Provider and can be virtually accessed from anywhere.
Setting up and maintaining enterprise infrastructure is very costly.	The Cloud Provider is responsible for the hardware infrastructure setup and maintenance.
Implementing security within the data centre and applications deployed within them is difficult.	The Cloud Provider provides additional security configurations for the applications being deployed.

By Dasika Madhu Nimeshika

ADVANTAGES OF CLOUD COMPUTING

Advantages of Cloud Computing

1. Trade capital expense for variable expense
   Do not invest in on-premise data centres or servers.

2. Benefit from massive economies of scale
   Economies of scale translate into a 'pay-as-you-go' cost-saving model.

3. Stop guessing capacity
   Eliminate guessing the required capacity based on existing infrastructure.

4. Increase speed and agility
   Provisioning new servers or databases can be done and can be accessed by the teams who require them very quickly.

5. Stop spending money running and maintaining data centres
   Using the resources provisioned in a cloud environment removes all infrastructural heavy lifting.

6. Go global in minutes
   Global deployment of application resources in multiple geolocations can be done within miutes.

By Dasika Madhu Nimeshika

AWS CLOUD VALUE PROPOSITION

CLOUD VALUE PROPOSITION

"Safe, secure access to highly available, reliable, and durable IT resources such as computing power, storage, and databases, on an as-needed basis with pay-as-you-go pricing."

AWS CLOUD VALUE PROPOSITION

Security	AWS offers multiple Security and Compliance services for various applications. The Shared Responsibility Model offers options for configuring extra security measures.
Agility	Applications can be developed and deployed globally across multiple geolocations within minutes. The speed of experimentation, developing and deploying is exponentially greater compared to applications developed on-premises.
Flexibility	AWS offers multiple services for various applications. There are over 200 products that support a variety of workloads ranging from website hosting to AI-ML and Big Data.
Elasticity	Applications can scale the resources required for smooth operability based on the demand. This ensures that the capacity of the application is sufficient to deal with the incoming requests while paying for only what they use.
Cost	AWS makes it easy to scale up and down based on demand and removes the need for an on-premise data centre and these reduce costs. Using the pay-as-you-go model, costs incurred can be monitored and reduced.

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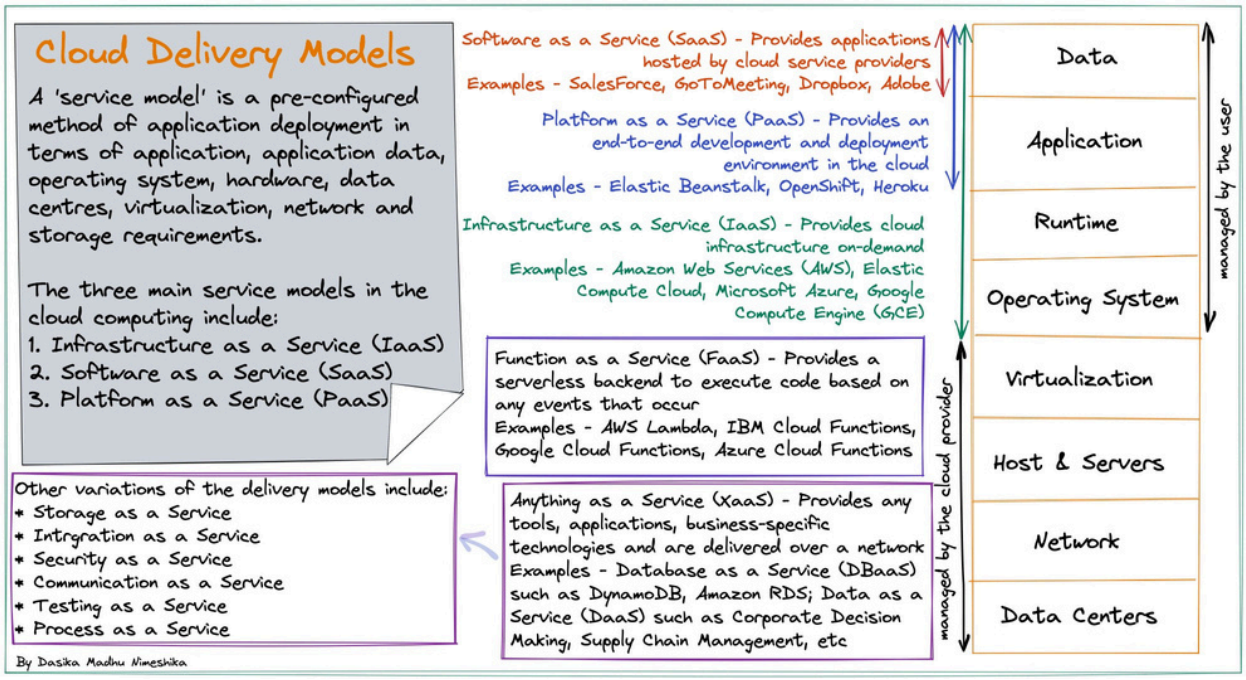
CLOUD DELIVERY/SERVICE MODELS

- Cloud Computing provides different models and strategiesto meet different needs.
- The purpose of grouping the various cloud servicesinto models is to make them more accessible for different use cases.



CLOUD DEPLOYMENT MODELS

PUBLIC CLOUD

* For organizations with fluctuating demands
* Used for developing, testing and deploying applications with low-security concerns
* Pay for networking services, hardware virtualization (OS, CPU, memory) or software on a subscription basis
* Requires minimal investment, no hardware or infrastructure setup
* Has security and reliability issues
* Subscription licenses limit resource usage

PRIVATE CLOUD

* For organizations who manage their cloud resources within their existing data centre
* It is expensive to set up and maintain the infrastructure required
* Infrastructure can be provided by a Cloud service Provider or the organization itself
* They have better security and reliability when compared to public clouds
* The scalability of the cloud resources is limited

Cloud Deployment Models are defined according to where the infrastructure for the deployment resides and who has control over it.

HYBRID CLOUD

* For an organization that requires interconnected public and private cloud infrastructure and resources
* Organizations use this model when they need to scale up their IT infrastructure rapidly
* Critical data can be stored in the private cloud while the trivial data can be stored on the public cloud
* It is cost-effective and offers higher security
* It requires greater knowledge of on-premise data centres, public/ private cloud

COMMUNITY CLOUD

* Similar to public cloud but supports common use cases and objectives
* Access is restricted to the members of said community
* Usually managed and hosted internally or by a third-party vendor
* Offers higher security than public cloud but is limited to the community resources and services
* Requires smaller investment for infrastructure and hardware setup
* Shared resources has restricted bandwidth and storage capacity

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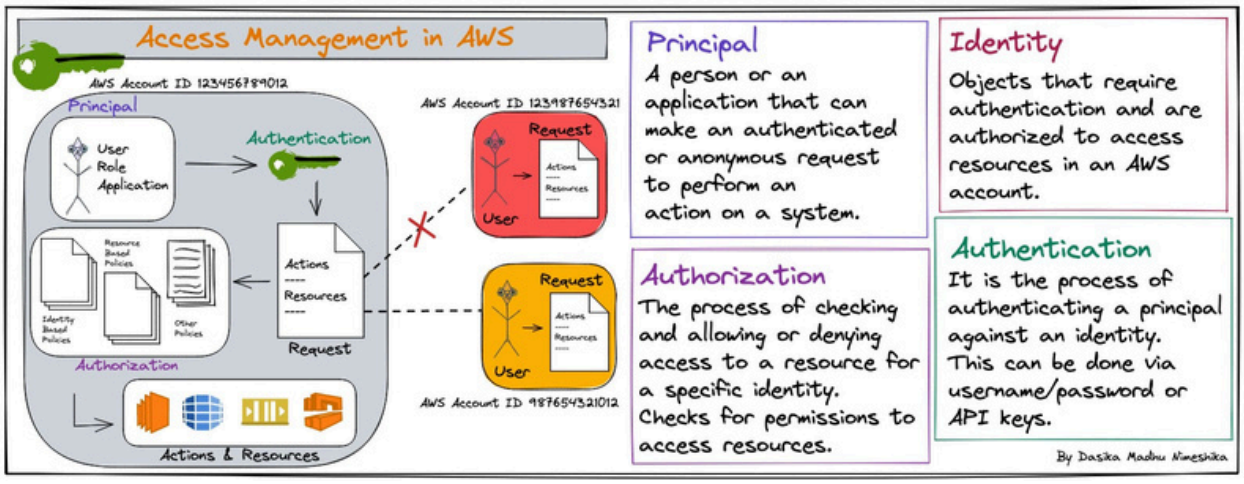
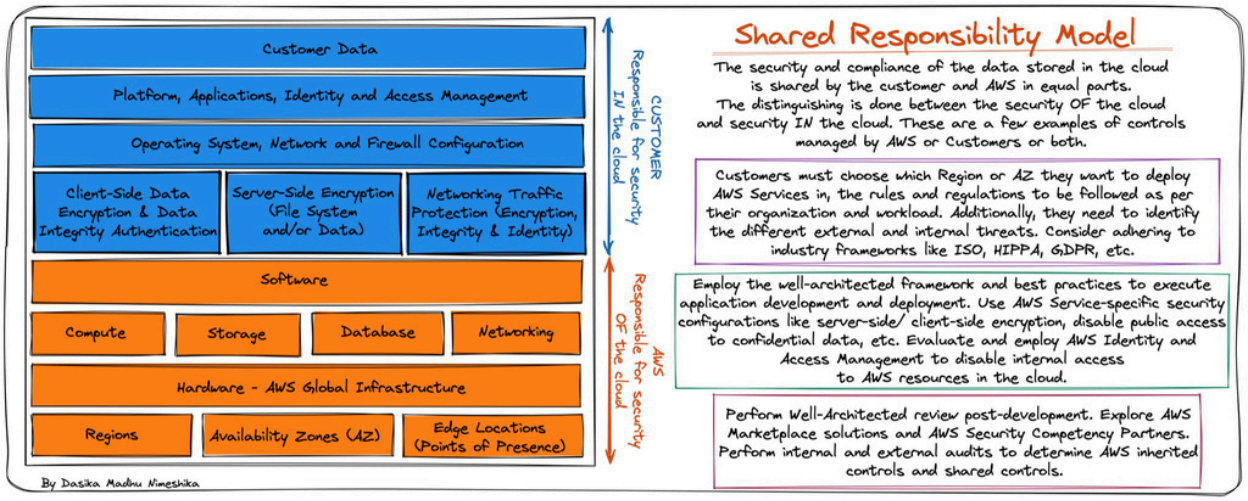
CLOUD ACCESS MANAGEMENT

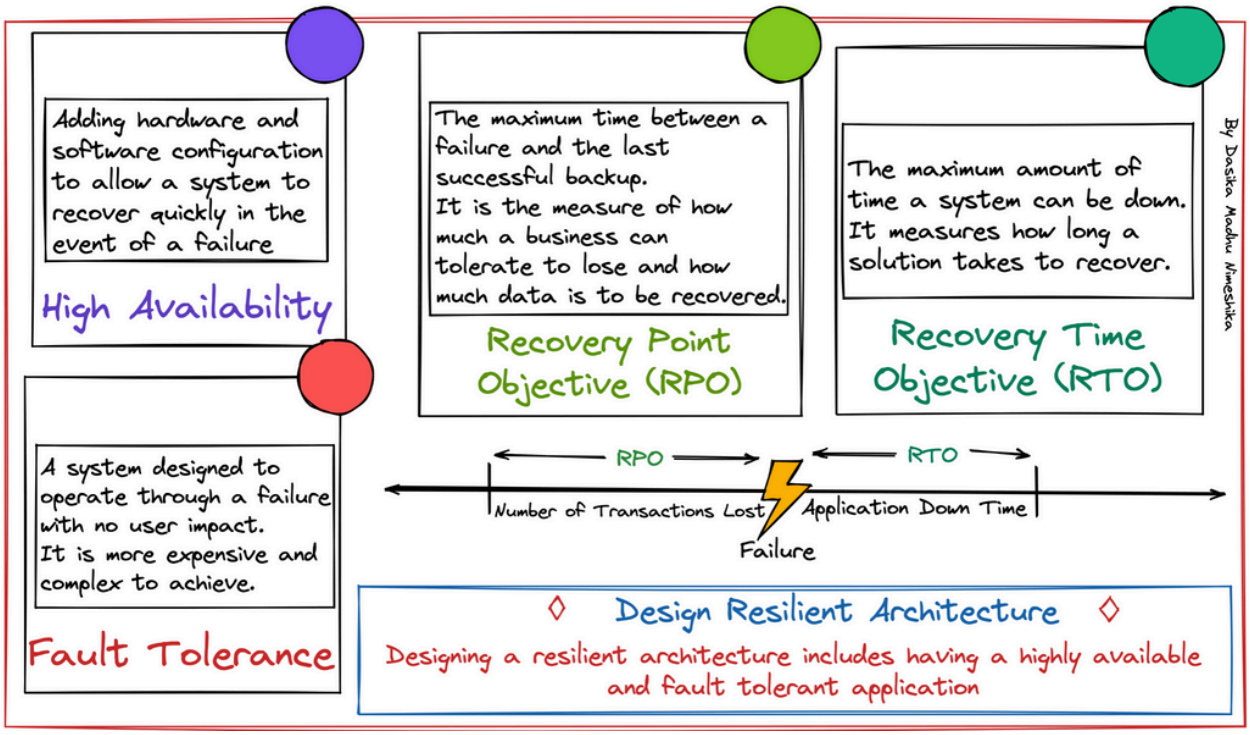


AWS SHARED RESPONSIBILITY MODEL



DESIGN RESILIENT ARCHITECTURE

- 'Everything fails all the time'.
- Keep in mind that system failure is inevitable.
- Architect an application with high availability, faulttolerance and a low RPO and RTO to minimize downtime.



SCALING

Scaling

The process of increasing or decreasing resources to ensure that the application capacity meets the demands.

Vertical Scaling - Scale by adding more power (like CPU or RAM) to an existing machine

Horizontal Scaling - Increasing the number of systems in a computing system without changing the size of any individual node

Horizontal Scaling

Involves achieving supply capacity closer to demand by appending smaller units.

There is less wastage of resources and the investment is less for smaller systems and servers.

Hence there is less risk of performance impact as each the increment is less expensive.

But there are points where capacity is less or more than demand.

Elastic Scaling

Involves automating horizontal scaling to match capacity with demand.

Demand may increase or decrease abruptly. An efficient application should scale in and out, to match demands.

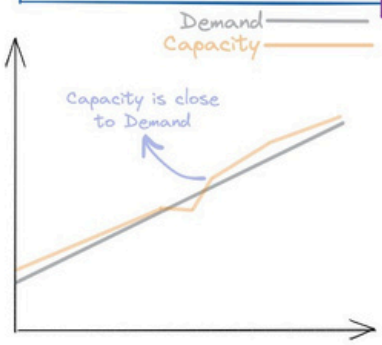
Vertical Scaling

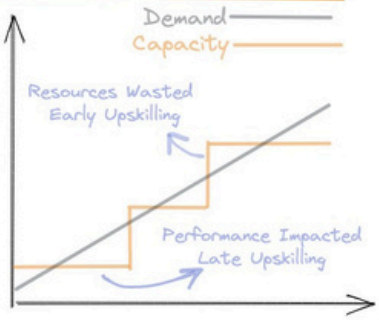
Involves upscaling and downscaling capacity and power of a machine in accordance with demand.

Used by traditional legacy systems.

An attempt made to forecast demand and purchase servers ideally, before the demand passes current capacity.

If upscaling is done too early, the capacity is wasted. If upscaling is done too late, the performance is impacted.





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GLOBAL INFRASTRUCTURE

AWS Global Infrastructure

AWS offers a highly secure, reliable, available cloud platform to develop and deploy applications globally within minutes.

Benefits of having a robust infrastructure:

* Low latency & low packet loss
* Easy usage
* Highly reliable and available
* Fault-tolerant
* Highly secure
* High throughput
* Highly redundant networking

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Regions (25)
Largest physical hardware data centres managed by AWS. They can withstand large amounts of failure.

Availability Zones (81)
Slightly smaller data centres within Regions that are closer to the users and store redundant data. They are used to facilitate high speed and low latency network connectivity.

Edge Locations (218)
Smallest pockets of compute, storage and networking facilities mainly used for edge computing and high speed content delivery.

Local Zones (7)
Select AWS services, like compute and storage services to move the closer to more end-users, providing them with low latency access to the applications running locally.

Regional Edge Caches (12)
Caches servers to store content nearer to the end-user. Primarily used by CloudFront. They are located between origin server and the Edge Locations (Points of Presence).

Wavelength Zones (14)
Used to deliver ultra-low latency applications for 5G devices - optimized for mobile edge computing applications. Application traffic can reach application servers without leaving the mobile network

Outposts
Offer the same Infrastructure, Services and APIs to any data centre to facilitate a hybrid cloud environment.
Used for low-latency computing, migration and modernization of applications, low data processing, data residency for compliance, etc.

AWS WELL-ARCHITECTED

AWS Well-Architected Framework

The Well-Architected Framework outlines the core concepts of AWS and their design principles. It covers the cloud-best architectural practices to keep in mind while implementing them to make an application highly available, fault-tolerant, resilient.

Operational Excellence

The ability to support development and run workloads effectively, gain insight into their operations, and to continuously improve supporting processes and procedures to deliver business value.

* Perform operations as code.
* Annotate documentation.
* Make frequent, small, reversible changes.
* Refine operations & procedures frequently.
* Anticipate failure.
* Learn from all operational failures.

Security

The security pillar describes how to take advantage of cloud technologies to protect data, systems, and assets in a way that can improve your security posture.

* Implement a strong identification foundation.
* Enable traceability.
* Apply security at all layers.
* Automate security best practices.
* Protect data in transit and rest.
* Prepare for security events.

Reliability

The reliability pillar encompasses the ability of a workload to perform its intended function correctly and consistently when it's expected to including the ability to operate and test the workload through its total lifecycle.

* Test recovery procedures.
* Automatically recover from failure.
* Scale horizontally to increase aggregate system availability.
* Stop guessing capacity.
* Manage change in automation.

Performance Efficiency

The ability to use computing resources efficiently to meet system requirements, and to maintain that efficiency as demand changes and technologies evolve.

* Democratize advanced technologies.
* Go global in minutes.
* Use serverless architecture.
* Experiment more often.
* Mechanical sympathy.

*AWS Definitions

Cost Optimization

The ability to run systems to deliver business value at the lowest price point.

* Adopt a consumption model.
* Measure overall efficiency.
* Stop spending money on data centre operations.
* Analyze and attribute expenditure.
* Use managed services to reduce cost of ownership

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AWS BILLING AND COST MANAGEMENT

Billing and Cost Management in AWS

It is a service that AWS provides to monitor resource usage and manage costs. AWS charges the card set up as the default payment method in the account. Other AWS Services you can use to manage costs include AWS Budget, Cost Explorer and AWS Organization.

AWS Pricing Calculator can help you figure out the approximate charges that may be incurred on the resources you use before you provision them.

Isolated billing information is tagged to every AWS account initially in credit card form, which can be later made into traditional, term-based invoicing being billed only for the resources in your account.

Benefits of using Billing and Cost Management:

* Estimate and plan your AWS costs
* Receive alerts if your costs exceed a threshold that you set
* Assess your biggest investments in AWS resources
* Simplify your accounting if you work with multiple AWS accounts

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AWS Cost and Usage Reports (CUR)

"Dive deeper into your AWS costs and usage"

* Returns a cumulative set of cost and usage data
* Create and manage reports that break down costs into preconfigured granularity or services
* Provide estimates of costs related to your AWS account
* The data is updated daily based on the configurations
* You can deliver the reports to an existing S3 bucket and query it using Amazon Athena
* It is possible to update the report up to three daily
* Use the CUR API to create, delete and retrieve the reports

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Cost Explorer

"Visualize, understand, and manage your AWS costs and usage over time"

* Create custom cost reports
* Analyze data at various levels
* Identify trends, pinpoint major costs and detect anomalies
* Set custom time periods and granularity
* Filter and group data
* Forecast future costs

Budgets

"Improve planning and cost control with flexible budgeting and forecasting"

* Set custom budgets to track costs for all use cases
* Set alerts to get notified when cost crosses your budget
* Create annual, quarterly, monthly or daily budgets based on your requirements
* Help you monitor, report and respond to costs incurred
* Types of budgets: Cost, Usage, RI utilization and RI coverage

How to - Billing & Cost Management

AWS Free Tier

"Gain free, hands-on experience with the AWS platform, products, and services"

* The free tier is offered to every new account user for 12 months
* If the usage limit hasn't been crossed, the free tier services can still be used
* Types of offers: Always free, Trail-based and 12 months free

Bills & Payment History

* AWS charges you monthly for the services used, you can check the cost incurred in the Billing and Cost Management dashboard
* A chart shows the proportion of costs spent for each service used and a forecast of the next month's cost is also displayed
* Track your payment history in the Orders and Invoices section to check all your past costs
* Use cost allocation tags (AWS-managed or user-defined) to track costs more extensively

AWS SUPPORT PLANS

*AWS Definitions

AWS Support Plans

Support plans provide different levels of services and support to AWS customers

Types of Support Plans:

1. Basic
2. Developer
3. Business
4. Enterprise

Basic Support Plan

Included for all AWS customers and includes:

1. Customer Service and Communities - 24x7 access to customer service, documentation, whitepapers, and support forums.
2. AWS Trusted Advisor - Access to the 7 core Trusted Advisor checks and guidance to provision your resources following best practices to increase performance and improve security.
3. AWS Personal Health Dashboard - A personalized view of the health of AWS services, and alerts when your resources are impacted.

Developer Support Plan

Recommended if you are experimenting or testing in AWS.

Business Support Plan

Recommended if you have production workloads in AWS.

Enterprise Support Plan

Recommended if you have business and/or mission critical workloads in AWS.

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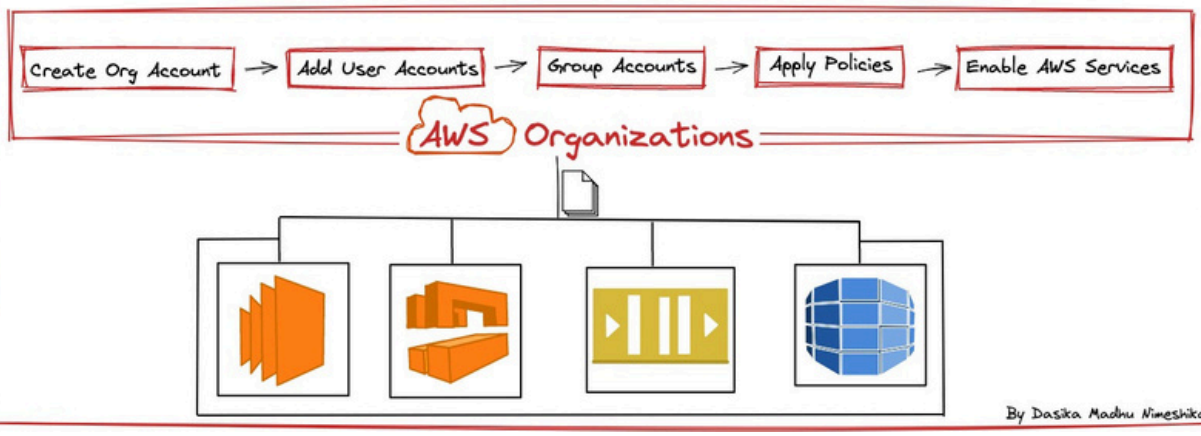
AWS ORGANIZATIONS

AWS Organization is a service for managing multiple accounts within a single business. Rather than managing many accounts, with many isolated sets of logins and individual bills, organizations allow consolidation of accounts and bills.

All accounts within an AWS Organization can consolidate bills into a single account -- one bill covering all business usage. Organizations can share bulk discounts and even easily manage accounts and permissions and limit account usage using service control policies.

Role switching is a method of accessing one account from another using only one set of credentials. It is used both within AWS Organisations and between two unconnected accounts.



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