

### Six advantages of cloud computing

Trade fixed expense for variable expense*	Pay only when you consume computing resources, and pay only for how much you consume
Benefit from massive economies of scale	Lower variable cost than you can get on your own because usage from hundreds of thousands of customers is aggregated in the cloud
Stop guessing capacity	Scale up and down as required with only a few minutes' notice
Increase speed and agility	IT resources are only a click away, reducing the time to use them from weeks to just minutes
Stop spending money running and maintaining data centers	Focus on projects, not the infrastructure
Go global in minutes	Deploy your application in multiple regions around the world with just a few clicks

\* Trade capital expense (CAPEX) for operational expense (OPEX)

### AWS Shared Responsibility model

Customer	Security <b>IN</b> the cloud. For example, customer data, firewall configuration, encryption, etc
AWS	Security <b>OF</b> the cloud. For example, all the infrastructure, internal security, etc

AWS is responsible for its infrastructure, whereas the users are responsible for how they use the infrastructure

### How to Access AWS

AWS Management console	Web application that comprises and refers to a broad collection of service consoles for managing AWS resources
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### How to Access AWS (cont)

AWS CLI	Unified tool to manage your AWS services using a command-line shell.
AWS CloudShell	Browser-based shell that you can launch directly from the AWS Management Console instead of using AWS CLI
AWS SDK	Access your AWS services programmatically. Many different languages support it (Node.js, Java, Python, PHP, etc.)

**Access Keys:** Long-term credentials for an IAM user or the AWS account root user. You can use access keys to sign programmatic requests to the AWS CLI or SDK.

TODO: AGREGAR LINK DE LA CONSOLA <https://console.aws.amazon.com/console/home>

### Scalability - Main Concepts

Elasticity	The ability to acquire resources as you need them and release resources when you no longer need them. In the cloud, you want to do this automatically
Scalability	A measurement of a system's ability to grow to accommodate an increase in demand. Vertical and horizontal scalability
High Availability	The percentage of time that a workload is available for use. It allows a system to continue functioning, even when certain components fail. We can achieve high availability thanks to scalability

### Types of Scalability:

- **Vertical:** We can scale-up by adding power, or scale-down by decreasing power. For example, convert your instance from *t2.nano* > *t2.medium*
- **Horizontal:** We can scale-out by adding instances, or scale-in by decreasing instances. For example, adding two more *t2.nano* instances. *t2.nano* > *3x t2.nano*



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Page 1 of 9.

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### Scalability - ELB & ASG

Elastic Load Balancers (ELB)	Load Balancers automatically distribute incoming application traffic across multiple targets, such as Amazon EC2 instances, handling the varying load of your application traffic
Auto Scaling Groups (ASG)	They will allow you to automatically scale your application by adding or removing instances according to certain conditions. You can define the minimum, desired, and maximum number of instances

#### Scaling strategies for ASG:

- **Optimize for availability:** Automatically maintain resource utilization at 40 percent. Useful when your application has urgent scaling needs.
- **Balance availability and cost:** Automatically maintain resource utilization at 50 percent. High availability while also reducing costs.
- **Optimize for cost:** Automatically maintain resource utilization at 70 percent. Lowering costs if your application can handle reduced capacity when unexpected changes.

### EC2 Storage - EBS

Block-storage service for EC2. It's a network storage drive, and you pay for the capacity you provision. You can back up the data on your Amazon EBS volumes to Amazon S3 by taking point-in-time incremental snapshots. You will also need to create snapshots to migrate an EBS between AWS Regions. You'll have to restore the snapshot in the Region where you want to copy it.

### EC2 Storage - Other Services

EC2 Instance Store	<b>Temporary</b> physically attached storage for your instance. It provides high performance / IOPS. 2
EFS	<b>File storage system</b> across multiple AZs and instances. It provides massively parallel shared access to thousands of instances

### Compute Services

Amazon Elastic Compute Cloud (Amazon EC2)	Compute platform with your choice of the latest processor, storage, networking, operating system, and purchase model to help you best match the needs of your workload
Amazon Elastic Container Service (ECS)	Container orchestration service that makes it easy to deploy, manage, and scale containerized applications.
Amazon Elastic Container Registry (ECR)	Fully managed service to host and register your containers
Amazon Elastic Kubernetes Service (EKS)	Managed container service to run and scale Kubernetes applications
AWS Fargate	Serverless compute for containers. Compatible with both ECS and EKS
AWS Lambda	Run code without provisioning or managing servers, just focus on your code. It automatically scales your application, and it supports many programming languages like Node, Python, Go, Java, etc
Amazon API Gateway	Create, publish, maintain, monitor, and secure APIs at any scale. You can manage separate environments, create API keys, validate requests & responses, etc



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### Compute Services (cont)

Amazon Lightsail Build applications and websites fast with low-cost, pre-configured cloud resources. Commonly used for blogs, ecommerce, or personal websites

AWS Batch Efficiently run hundreds of thousands of batch and ML computing jobs while optimizing compute resources

### Databases

Amazon Relational Database Service (RDS) Managed service to set up, operate, and scale **relational databases** in the cloud

AWS Database Migration Service (DMS) Service to **migrate** databases to AWS quickly and securely. For example, you can migrate on-premise DBs to RDS

Amazon DynamoDB Serverless fully managed **key-value NoSQL** database. It allows millions of requests per second

Amazon ElastiCache Fully managed **in-memory data store**, compatible with Redis or Memcached engines. Used for extreme performance and low latency

Amazon Redshift Columnar cloud **data warehouse**. OLAP

Amazon Neptune Serverless **graph** database

Amazon DocumentDB AWS Implementation for **MongoDB (NoSQL)**. You can store, query, index, and aggregate data in JSON format

### Databases (cont)

Amazon Quantum Ledger Database (QLDB) **Ledger** database. Used for recording financial transactions. Immutable

Amazon Timestream Serverless **time series** database

### Application Integration Services

Amazon Simple Queue Service (SQS) Fully managed message queuing service that enables you to decouple and scale microservices, distributed systems, and serverless applications

Amazon Simple Notification Service (SNS) Fully managed publisher/subscriber messaging service. Subscribers won't have to poll anything, they subscribe to a topic, and they will receive the messages

Amazon Kinesis Real-time data streaming service that captures gigabytes of data per second

Amazon MQ Managed message broker service for Apache ActiveMQ and RabbitMQ that makes it easy to set up and operate message brokers on AWS

### Data Analytics Services

Amazon Athena Interactive **serverless** query service that easily analyzes data in Amazon S3 using standard SQL 5

Amazon RedShift Spectrum Perform SQL queries on Amazon S3. Similar to Athena, without being serverless, used for really frequent complex queries



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### Data Analytics Services (cont)

Amazon QuickSight	Business Intelligence service to create interactive dashboards
AWS Glue	ETL serverless managed service to discover, prepare, and combine data
AWS Elastic Map Reduce (EMR)	Platform to process, analyze, and apply machine learning to big data

### Content Delivery Services

Amazon Route 53	Highly available and scalable Domain Name System (DNS) web service. Route 53 connects user requests to internet applications running on AWS or on-premises
Amazon CloudFront	Amazon CloudFront is a fast Content Delivery Network (CDN) that can improve your read performance as content is cached at the edge. Great for static content that must be available everywhere
AWS Global Accelerator	Networking service that improves the performance of your users' traffic
S3 Transfer Acceleration	Speed up content transfers to and from Amazon S3 by as much as 50-500% for long-distance transfer of larger objects

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### Monitoring Services

Amazon CloudWatch	It collects and visualizes real-time logs, metrics, and event data in automated dashboards to streamline your infrastructure and application maintenance.
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### Monitoring Services (cont)

Amazon EventBridge (CloudWatch Events)	It responds to AWS resource changes and takes actions. You can also schedule automated actions like CRON or rate expressions
AWS CloudTrail	Monitor and record account activity across your AWS infrastructure. For example, you can check the account that deleted an EC2 instance
AWS X-Ray	Monitoring service to analyze and debug production and <b>distributed</b> applications. You can see all your architecture with it
AWS Health Dashboard	Single place to learn about the availability and operations of AWS services

### Security Services

AWS Key Management Service (KMS)	Service to create and manage cryptographic keys to encrypt your data
AWS CloudHSM (Hardware Security Model)	Hardware security module to quickly generate and use your encryption keys on the AWS Cloud
AWS Web Application Firewall (WAF)	Protect your web applications or APIs against common web exploits and bots that may affect availability, compromise security, or consume excessive resources



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Page 4 of 9.

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### Security Services (cont)

AWS Shield	Managed Distributed Denial of Service (DDoS) protection service that safeguards applications running on AWS. AWS Shield Standard is automatically enabled to all AWS customers at no additional cost
AWS Network Firewall	You can define firewall rules that provide fine-grained control over network traffic
AWS Certificate Manager (ACM)	Provision and manage <b>SSL/TLS</b> certificates
AWS Secrets Manager	Store secrets, <b>rotate secret keys</b> , and easily integrate with databases
AWS Artifact	Central resource for compliance-related information. You can access reports from reports from AWS and ISVs
Amazon GuardDuty	Threat detection service that continuously monitors your AWS accounts and workloads for malicious activity
Amazon Inspector	Automated vulnerability management service that continually scans AWS workloads for software vulnerabilities and unintended network exposure
AWS Config	Assess, audit, and evaluate the configurations of your AWS resources. It does not prevent the actions from happening; it only notifies us

### Security Services (cont)

Amazon Macie	Data security service that uses machine learning (ML) and pattern matching to discover and help protect your <b>sensitive data</b>
AWS Security Hub	Automate AWS security checks and centralize security alerts
Amazon Detective	Analyze and visualize security data to investigate potential security issues. You can quickly analyze and determine the nature and extent of possible security issues
AWS Backup	Cost-effective, policy-based service that automates data protection

### Deployment Services

AWS CloudFormation	Infrastructure as Code service to model, provision, and manage AWS and third-party resources as code. You can manually create templates of your whole infrastructure using the CloudFormation designer or a YAML file
AWS Elastic Beanstalk	Service to deploy and scale your web applications. It supports different programming languages (Java, .NET, PHP, Node.js, Python, Ruby, etc.) and will create the necessary resources directly for us (Load Balancer, ASG, etc.)

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Page 5 of 9.

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### CI/CD Services

AWS CodeCommit	Managed source control service that hosts private Git repositories. Similar to GitHub
AWS CodeBuild	Fully managed continuous integration service that compiles source code, runs tests, and produces software packages ready to deploy. Similar to CircleCI
AWS CodeDeploy	Fully managed deployment service that automates software deployments
AWS CodePipeline	Fully managed continuous delivery service that helps you automate your release pipelines. It orchestrates the previous services
AWS CodeStar	Service that groups the previous ones. Each AWS CodeStar project comes with a project management dashboard, including tracking capability by JIRA
AWS CodeArtifact	Package management for software development where you can store artifacts using popular package managers and build tools like Maven, Gradle, npm, etc
AWS Cloud9	Cloud IDE to develop code
Amazon CodeGuru	Testing tool to detect, track, and fix code security vulnerabilities. It uses Machine Learning for automated code reviews and performance recommendations

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### Account Management

Organizations	It lets you create new AWS accounts at no additional charge. With accounts in an organization, you can easily allocate resources, group accounts, and apply governance policies to accounts or groups.
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### Account Management (cont)

AWS Control Tower	Set up and govern a multi-account AWS environment. It uses AWS Organizations under the hood
AWS Resource Access Manager (AWS RAM)	It helps you securely share your resources across AWS accounts
AWS Service Catalog	Centrally manage your cloud resources to achieve governance at scale of your infrastructure as code (IaC) templates

### Identity

Amazon Cognito	Add user sign-up and sign-in features and control access to your web and mobile applications. It scales to millions of users
AWS Security Token Service (STS)	Request temporary, limited-privilege credentials for AWS Identity and Access Management (IAM) users
Directory Services	Also known as AWS Managed Microsoft AD, it's a fully managed Microsoft Active Directory service
AWS IAM Identity Center	Create and manage user identities in AWS, or connect your existing identity source, including Microsoft Active Directory, Okta, Ping Identity, JumpCloud, Google Workspace, and Azure Active Directory (Azure AD).



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Page 6 of 9.

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### Billing

AWS Compute Optimizer	Avoid overprovisioning and underprovisioning EC2 instances, EBS volumes, ECS on Fargate, and Lambda functions
AWS Pricing Calculator	AWS Pricing Calculator lets you explore AWS services, and create an estimate for the cost of your use cases on AWS. Useful when you are migrating to the Cloud
AWS Billing Dashboard	Used to gain a general view of your AWS spending
AWS Billing Alarms	It will notify you by email when your AWS account charges for the month have exceeded a monetary amount you have set
AWS Budgets	You can set custom budgets to track your costs and usage, and respond quickly to alerts received from email or SNS notifications if you exceed your threshold.
AWS Cost Anomaly Detection	Service that uses advanced Machine Learning technologies to identify anomalous spend and root causes, so you can quickly take action
AWS Service Quotas	It helps you manage your quotas for many AWS services
AWS Trusted Advisor	It provides cost and security recommendations that help you follow AWS best practices

TODO: HABLAR DE Pricing Models, Savings Plan,  
 TODO: AGREGAR LINK EN PRICING CALCULATOR: <https://calculator.aws>

### Machine Learning Services

AWS SageMaker	Machine Learning solution to build, train, and deploy your ML models
AWS Rekognition	Image recognition and video analysis with machine learning
AWS Comprehend	Natural-language processing (NLP) service that uses machine learning to uncover valuable insights from text within documents
AWS Transcribe	Service to convert speech to text
AWS Polly	Service to convert text to speech
AWS Translate	Highly accurate translations
AWS Forecast	Time-series forecasting service
AWS Personalize	ML-powered personalization
Amazon Lex	Build chatbots with conversational AI
Kendra	Intelligent enterprise search service that helps you search across different content repositories with built-in connectors
Textract	Automatically extracts text, handwriting, and data from scanned documents

### Other Services

AWS Step Functions	Orchestrate AWS services (like Lambdas), automate business processes, and build serverless application workflows (standard or express)
AWS AppSync	Fully managed service that makes developing GraphQL APIs easy
AWS Amplify	Complete solution to create web and mobile applications



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### Other Services (cont)

Amazon WorkSpaces	It enables you to provision virtual, cloud-based Microsoft Windows, Amazon Linux, or Ubuntu Linux desktops for your users. Users can access their virtual desktops from multiple devices or web browsers
Amazon AppStream 2.0	Service that can be configured for SaaS application streaming or delivery of virtual desktops with selective persistence
AWS IoT Core	It lets you connect billions of IoT devices to the cloud without managing infrastructure
AWS Device Farm	Application testing service to test your web and mobile apps across an extensive range of desktop browsers and real mobile devices
AWS Fault Injection Simulator	Managed service for running fault injection experiments to improve an application's performance, observability, and resiliency
AWS Pinpoint	Customizable tool to deliver customer communications across channels, segments, and campaigns at scale

### AWS Well-Architected Framework - Pillars

Operational Excellence	It focuses on continually improving processes and procedures
Security	It focuses on protecting information and systems
Reliability	It focuses on workloads performing their intended functions and how to recover quickly from failure

### AWS Well-Architected Framework - Pillars (cont)

Performance Efficiency	It focuses on structured and streamlined allocation of IT and computing resources
Cost Optimization	It focuses on avoiding unnecessary costs
Sustainability	It focuses on minimizing the environmental impacts of running cloud workloads

The Well-Architected Framework is a set of best practices and guidelines developed by AWS to help organizations design, build, and operate reliable, secure, efficient, and cost-effective applications and infrastructure in the cloud. It is based on the following pillars:

TODO: PONERLO ARRIBA!!

### Operational Excellence - Design principles

Perform operations as code

Make frequent, small, reversible changes

Refine operations procedures frequently

Anticipate failure

Learn from all operational failures

Use managed services

Implement observability for actionable insights

<https://docs.aws.amazon.com/wellarchitected/latest/operational-excellence-pillar/operational-excellence.html>

### Security Pillar - Design principles

Implement a strong identity foundation

Maintain traceability

Apply security at all layers

Automate security best practices

Protect data in transit and at rest

Keep people away from data

Prepare for security events

You can read about security design principles at the following link:  
<https://docs.aws.amazon.com/wellarchitected/latest/security-pillar/security.html>



By cabanasj486

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### Reliability Pillar - Design Principles

Automatically recover from failure

Test recovery procedures

Scale horizontally to increase aggregate workload availability

Stop guessing capacity

Manage change through automation

<https://docs.aws.amazon.com/wellarchitected/latest/reliability-pillar/design-principles.html>

### Performance Efficiency - Design Principles

Democratize advanced technologies

Go global in minutes

Use serverless architectures

Experiment more often

Consider mechanical sympathy

<https://docs.aws.amazon.com/wellarchitected/latest/performance-efficiency-pillar/design-principles.html>

### Cost Optimization Pillar - Design Principles

Implement cloud financial management

Adopt a consumption model

Measure overall efficiency

Stop spending money on undifferentiated heavy lifting

Analyze and attribute expenditure

<https://docs.aws.amazon.com/wellarchitected/latest/cost-optimization-pillar/design-principles.html>

### Sustainability Pillar - Design Principles

Understand your impact

Establish sustainability goals

Maximize utilization

Anticipate and adopt new, more efficient hardware and software offerings

Use managed services

Reduce the downstream impact of your cloud workloads

<https://docs.aws.amazon.com/wellarchitected/latest/sustainability-pillar/design-principles-for-sustainability-in-the-cloud.html>



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