

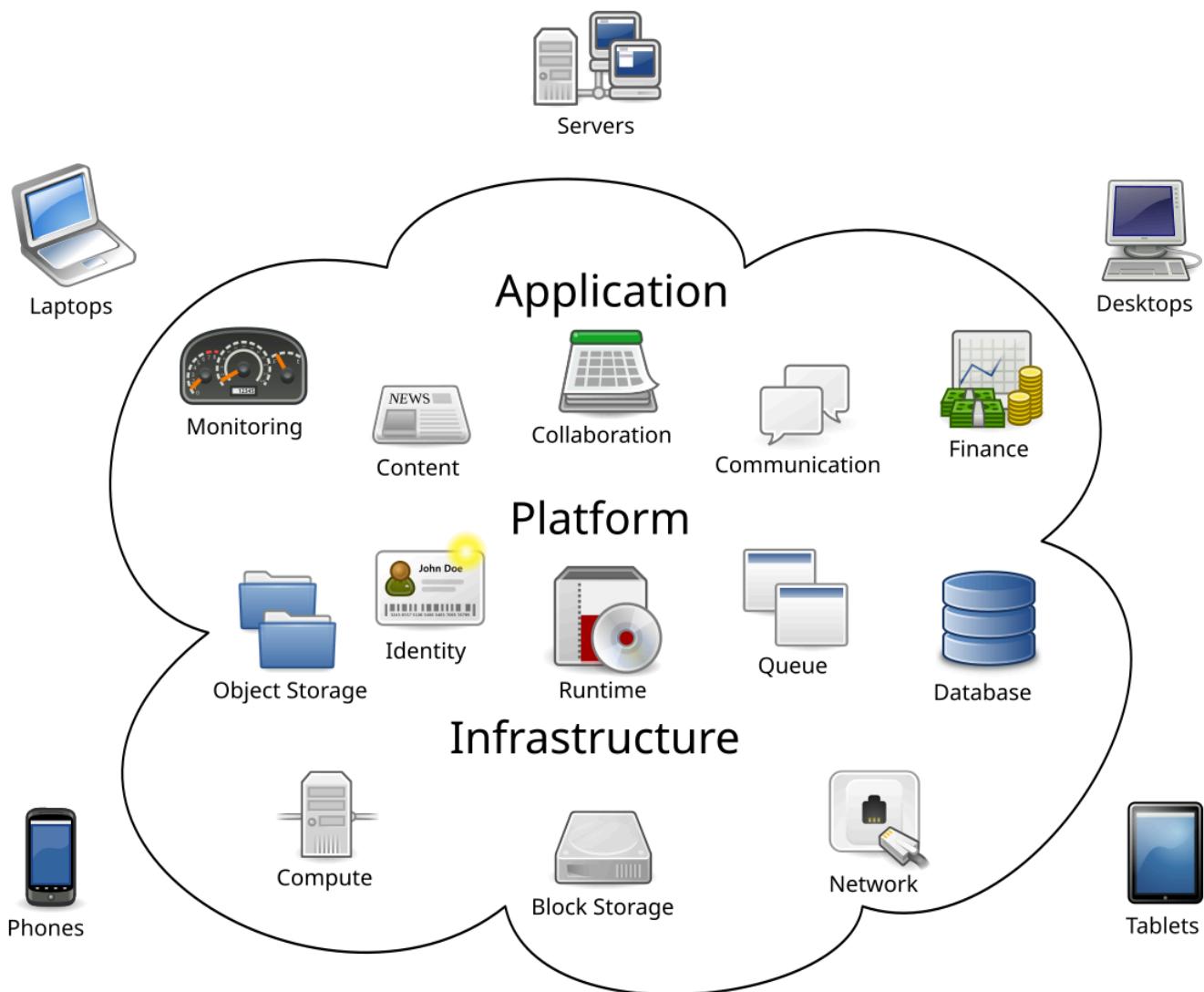
Cloud Fundamentals

Cloud Fundamentals

1. What is Cloud Computing?

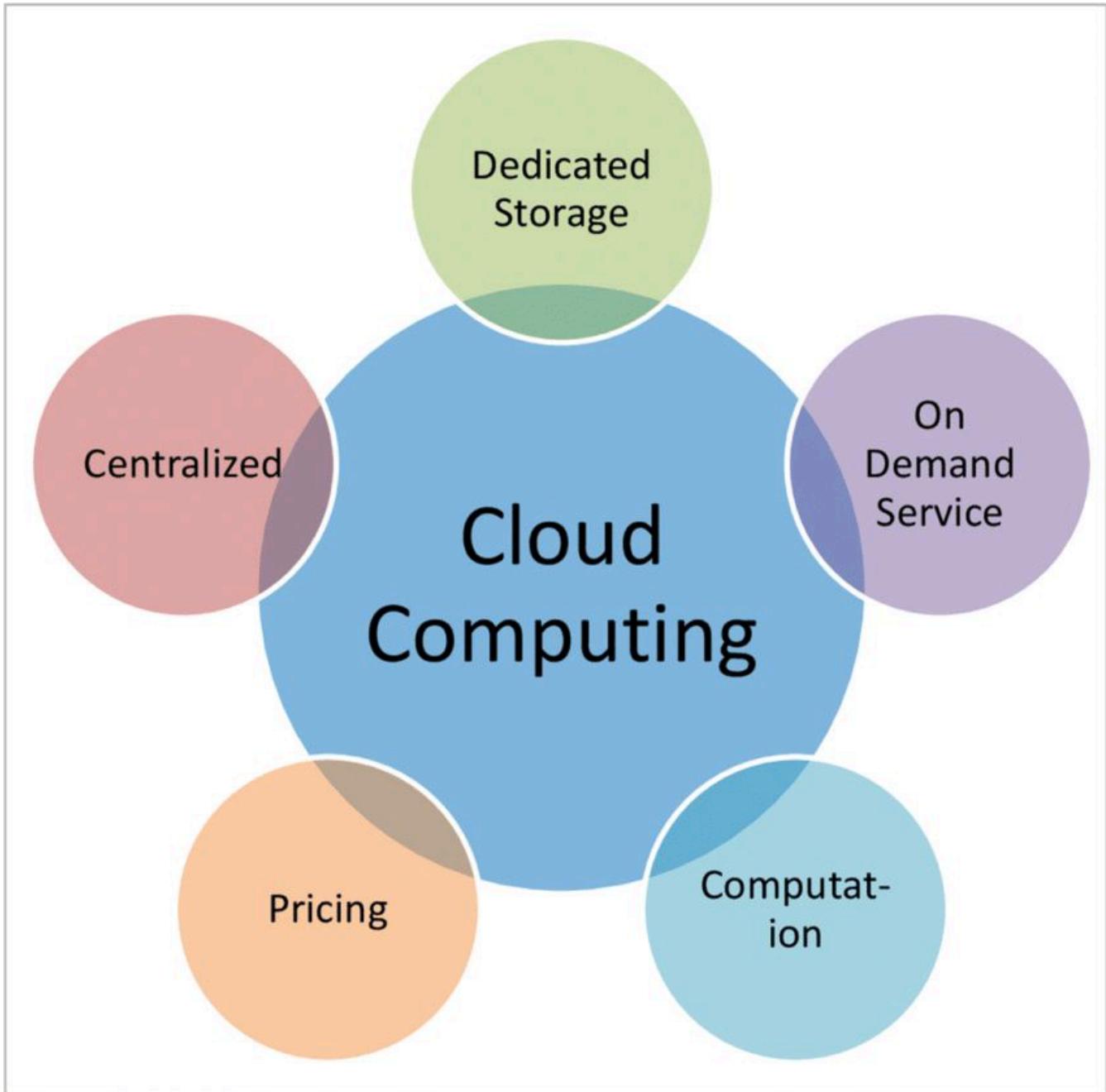
Cloud computing is the **delivery of computing services**—servers, storage, databases, networking, software, analytics, AI, and more—**over the Internet (“the cloud”)**.

👉 Instead of owning physical data centers or servers, companies rent resources from cloud providers like **AWS, Microsoft Azure, or Google Cloud (GCP)**.



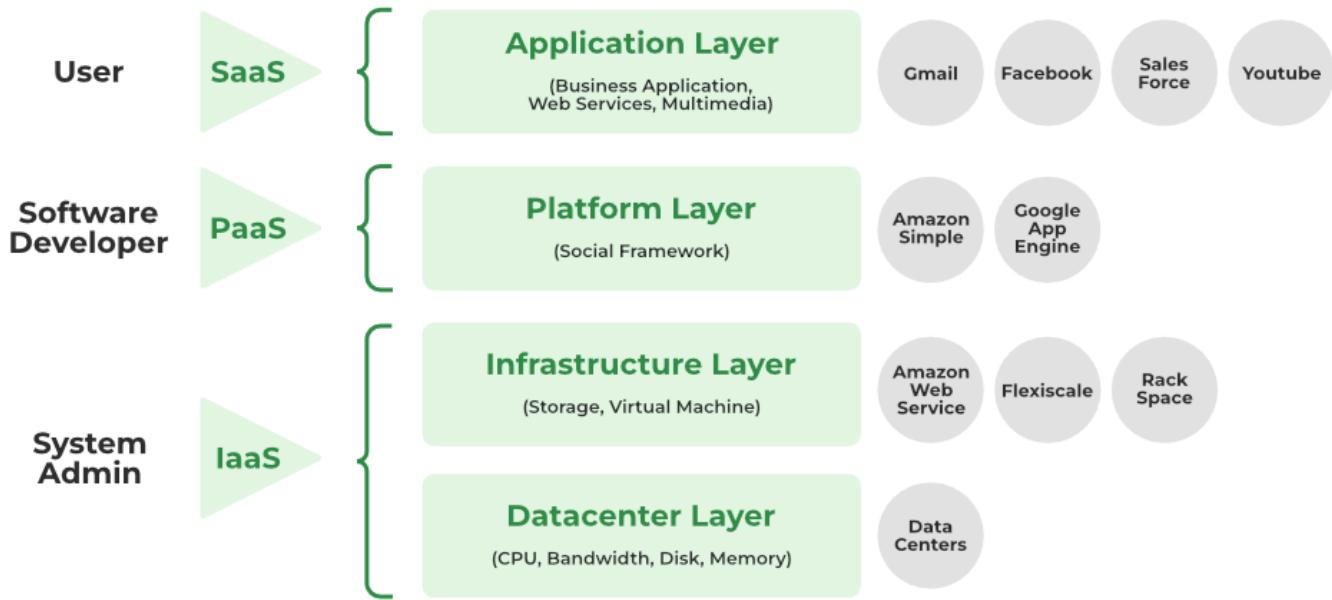
2. Key Characteristics of Cloud

1. **On-Demand Self-Service** – Provision resources anytime without manual setup.
2. **Broad Network Access** – Available via the internet from anywhere.
3. **Resource Pooling** – Shared infrastructure with multi-tenancy.
4. **Rapid Elasticity** – Scale up/down instantly as per demand.
5. **Measured Service** – Pay only for what you use (pay-as-you-go).



3. Cloud Service Models (The “SPI” Model)

Cloud Computing Layers



IaaS (Infrastructure as a Service):

- Provides raw computing resources like servers, storage, and networking.
- Example: AWS EC2, Google Compute Engine, Azure VMs.

PaaS (Platform as a Service):

- Provides development platforms, runtime environments, and tools.
- Example: Google App Engine, AWS Elastic Beanstalk, Azure App Services.

SaaS (Software as a Service):

- Ready-to-use applications over the internet.
- Example: Gmail, Salesforce, Microsoft 365.

4. Cloud Deployment Models

1. **Public Cloud** – Services delivered over the internet (e.g., AWS, Azure, GCP).
2. **Private Cloud** – Exclusive use by a single organization (on-premises or hosted).
3. **Hybrid Cloud** – Mix of public + private clouds.
4. **Multi-Cloud** – Use of multiple cloud providers to avoid lock-in.

5. Benefits of Cloud Computing

- **Cost Savings** (CapEx → OpEx model).
- **Scalability & Flexibility**.
- **Global Reach**.

- **Security & Compliance.**
- **Faster Time-to-Market.**
- **Managed Services** (less maintenance burden).

6. Risks & Challenges

- **Data Security & Privacy** concerns.
- **Downtime / Service outages.**
- **Vendor Lock-in** (difficult to switch providers).
- **Compliance Issues** (GDPR, HIPAA).
- **Cost Management** (unexpected bills if not monitored).

7. Examples of Popular Cloud Providers

- **AWS (Amazon Web Services)** – Market leader.
- **Microsoft Azure** – Enterprise-focused.
- **Google Cloud (GCP)** – Strong in data analytics & AI.
- **IBM Cloud, Oracle Cloud, Alibaba Cloud** – Specialized use cases.

8. Cloud Computing Use Cases

- **Storage & Backup** (Google Drive, Dropbox).
- **Web Hosting** (AWS EC2, Azure App Service).
- **Big Data & Analytics** (Google BigQuery, AWS Redshift).
- **Machine Learning & AI** (Azure ML, Google Vertex AI).
- **Disaster Recovery** (AWS Backup, Azure Site Recovery).

9. Cloud vs Traditional IT

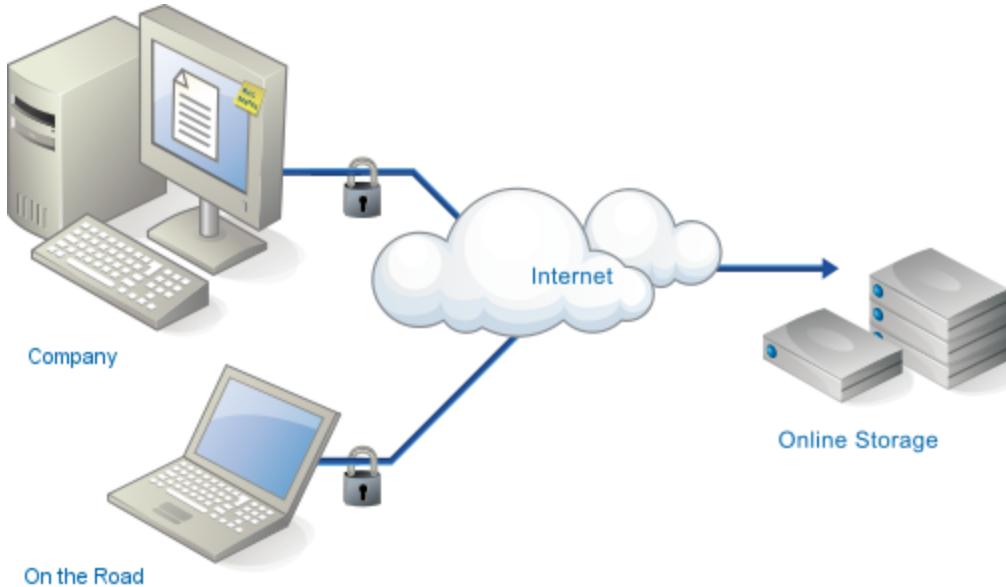
Feature	Traditional IT	Cloud
Cost	Heavy upfront CapEx	Pay-as-you-go OpEx
Scalability	Limited, manual	Instant, automatic
Maintenance	Customer responsibility	Provider responsibility
Deployment	Weeks to months	Minutes to hours
Location	On-premises	Accessible from anywhere

Cloud Storage

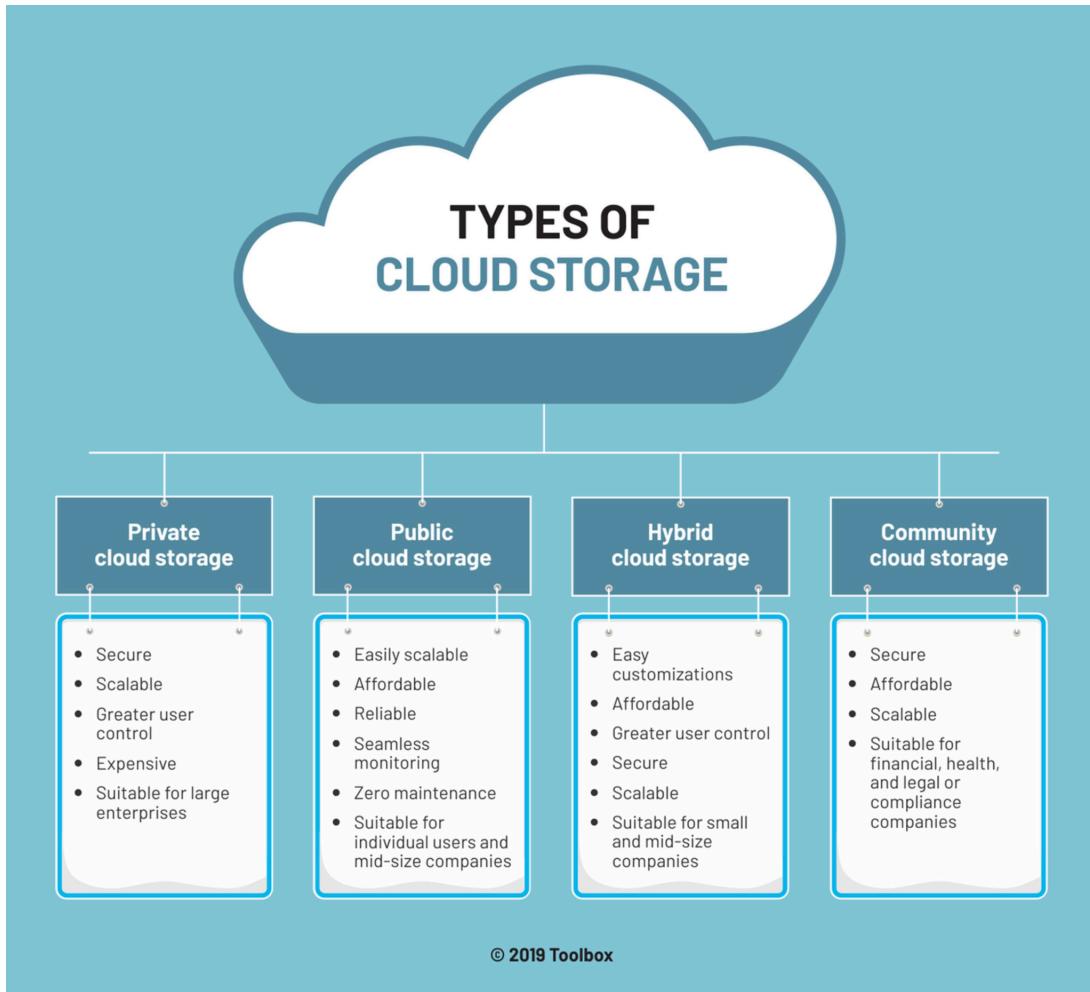
1. What is Cloud Storage?

Cloud storage is a **service model** where digital data is stored in **logical pools** across multiple servers, managed by a cloud provider, and accessible over the internet.

👉 Instead of storing files on local hard drives, organizations store them in the cloud, ensuring **scalability, availability, and reliability**.



2. Types of Cloud Storage



Object Storage

- Stores data as **objects** (data + metadata + unique identifier).
- Ideal for unstructured data (images, videos, backups, logs).
- Examples: **Amazon S3, Google Cloud Storage, Azure Blob Storage.**

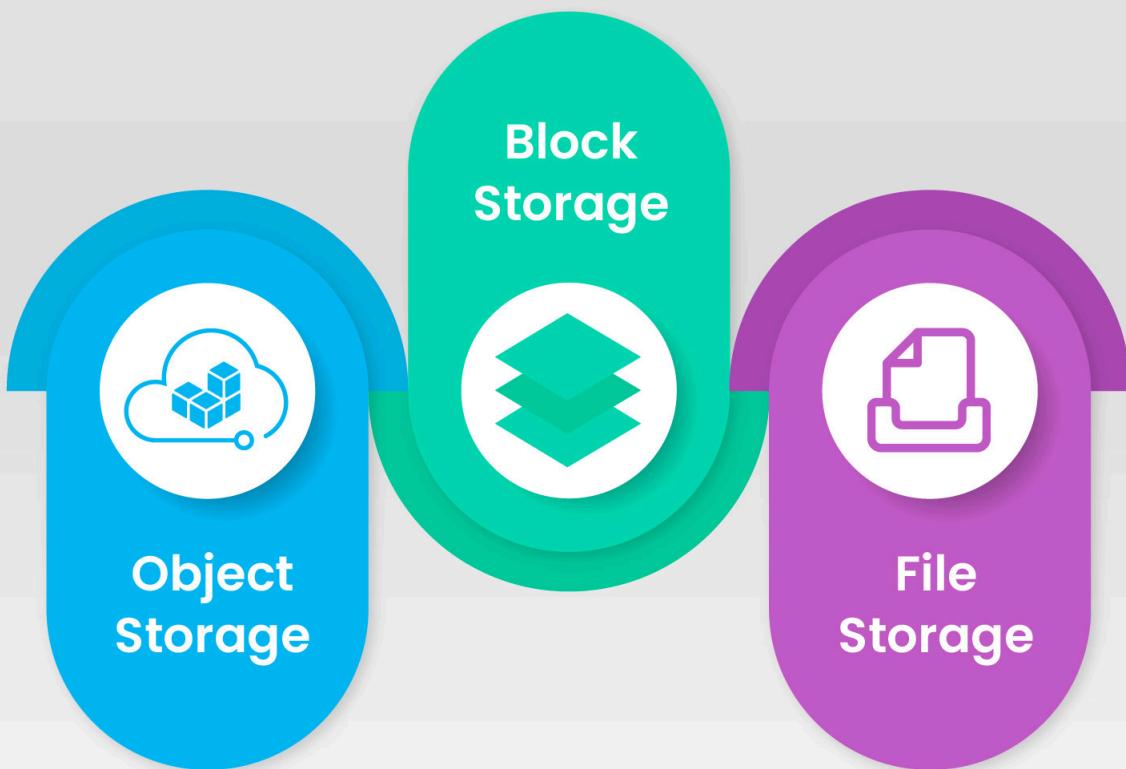
File Storage

- Stores data in a **hierarchical file system** (folders, directories).
- Suitable for applications needing file access.
- Examples: **Amazon EFS, Azure Files, Google Filestore.**

Block Storage

- Data stored in **fixed-sized blocks**, like traditional disks.
- High performance, used for databases or transactional workloads.
- Examples: **Amazon EBS, Azure Managed Disks, Google Persistent Disks.**

TYPES OF CLOUD STORAGE



3. Key Features

- **Scalability** – Store unlimited data.
- **Durability** – Multiple copies across regions.
- **Accessibility** – Anywhere, anytime with the internet.
- **Security** – Encryption (at rest & in transit).
- **Cost Efficiency** – Pay for what you use.

8 Key Features of Cloud Computing



4. Benefits of Cloud Storage

- **Backup & Recovery** – Automatic redundancy.
- **Collaboration** – Easy file sharing.
- **Elasticity** – Grow/shrink capacity dynamically.
- **Security** – Compliance with standards (GDPR, HIPAA).
- **Fast Deployment** – Minutes instead of weeks.



5. Risks & Challenges

- **Data Privacy** – Sensitive data exposure risks.
- **Network Dependency** – Requires internet access.
- **Vendor Lock-in** – Migration difficulty between providers.
- **Hidden Costs** – Data egress charges.

Eight Risks and Challenges for Cloud Computing



6. Popular Cloud Storage Services

- **Amazon S3** – Object storage, highly scalable.
- **Google Cloud Storage (GCS)** – Unified storage with classes (Standard, Nearline, Coldline, Archive).
- **Microsoft Azure Blob Storage** – For unstructured data.
- **Dropbox, Google Drive, OneDrive** – Consumer-level file storage.

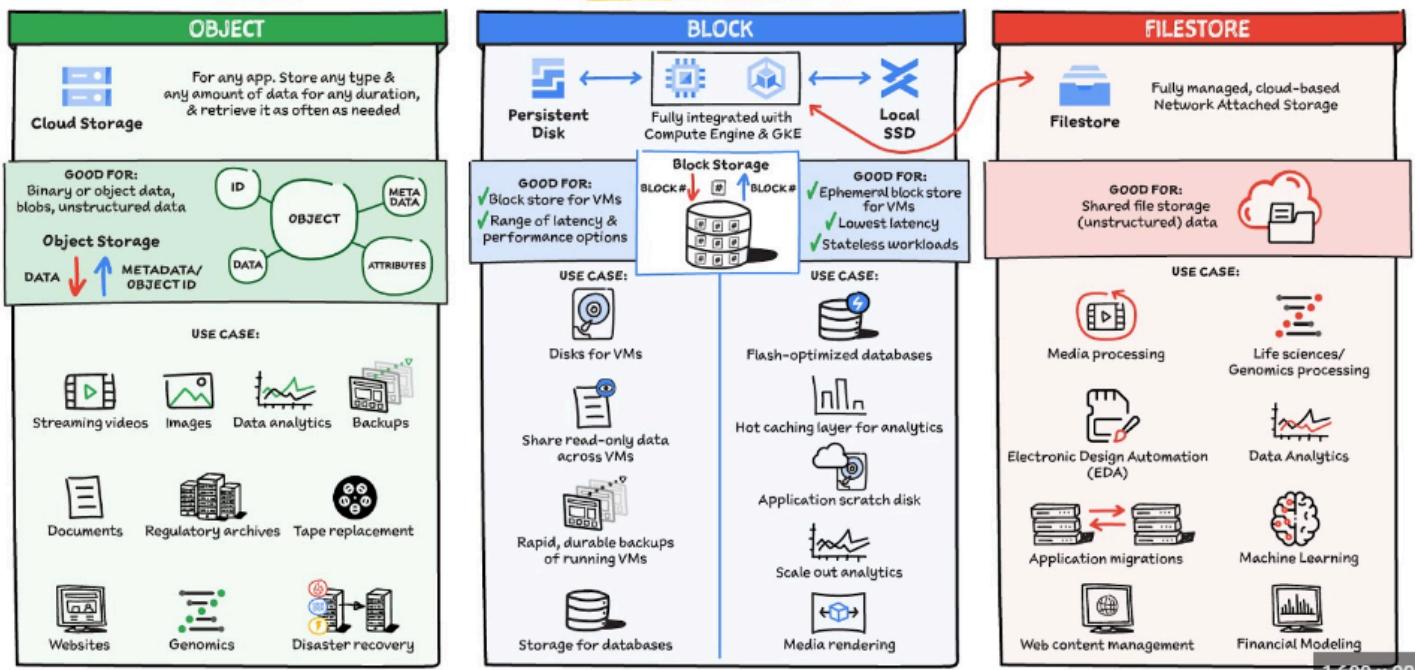


7. Cloud Storage Use Cases

- Backup & Disaster Recovery.
- Media & Content Delivery.
- Big Data Storage (logs, IoT data).
- Application Hosting.
- Enterprise Collaboration (Docs, Sheets, Teams).



Which Storage Should I Use?



In short:

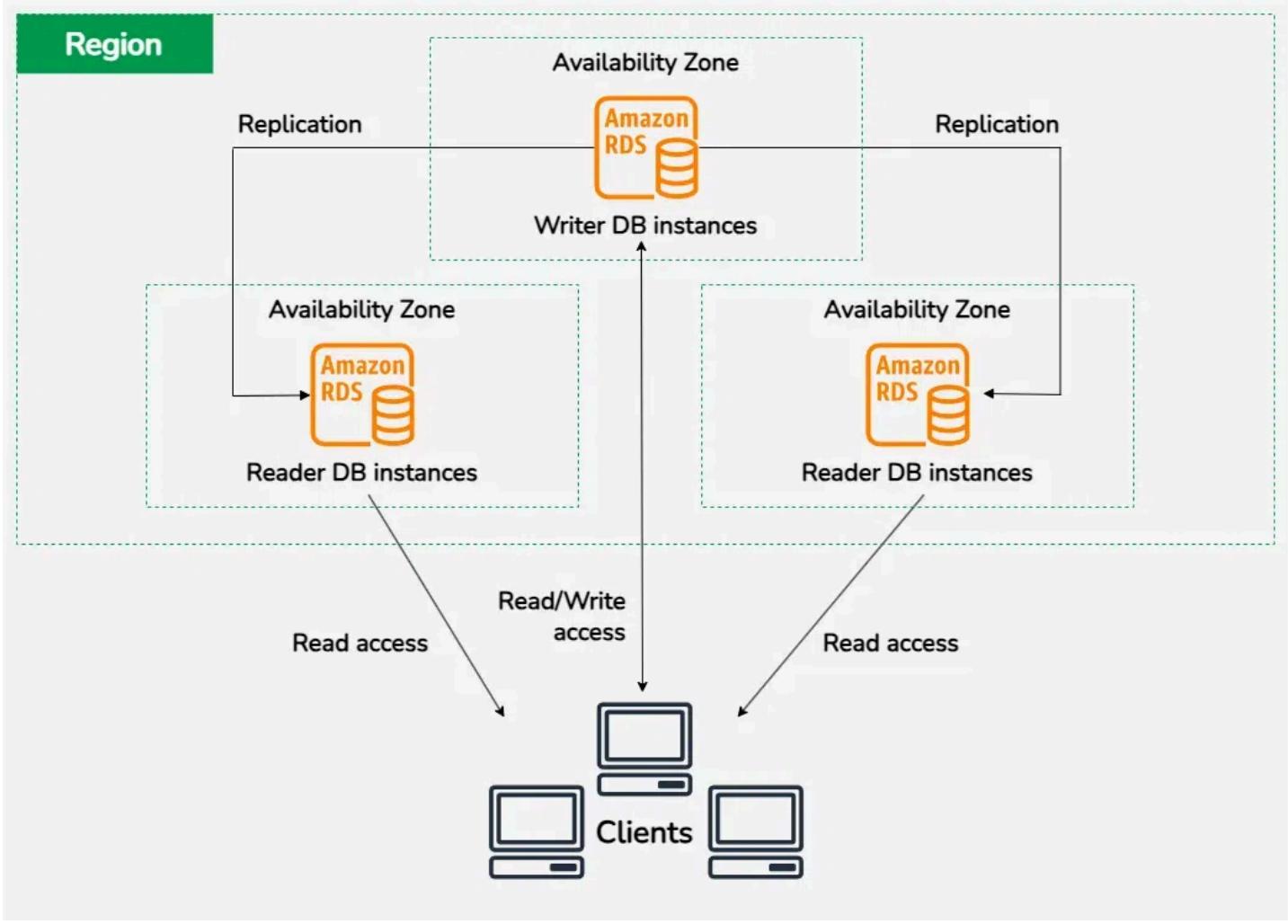
Cloud Storage = **Elastic, scalable, secure, and cost-efficient way to store and manage data online.**

Amazon RDS (Relational Database Service)

1. What is Amazon RDS?

Amazon RDS is a **managed relational database service** from AWS that makes it easy to set up, operate, and scale databases in the cloud. It supports various database engines like MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB. To get started with RDS, you'll need an AWS account and then you can create a database instance through the AWS Management Console.

👉 Instead of installing, patching, and maintaining databases manually, AWS manages the heavy lifting (hardware, backups, scaling, security).

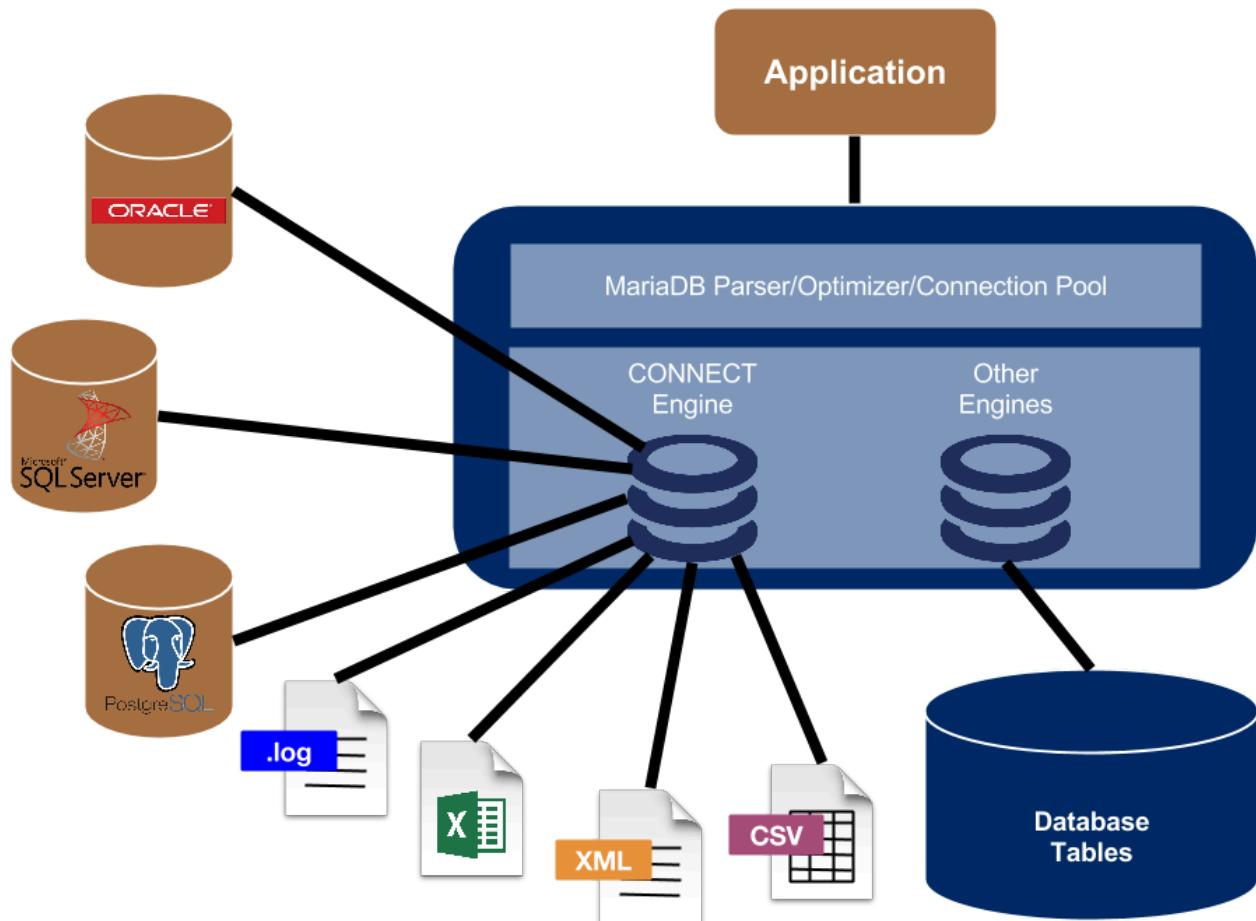


2. Supported Database Engines

Amazon RDS supports multiple popular engines:

- **Amazon Aurora** (MySQL & PostgreSQL-compatible, high performance)
- **MySQL**
- **PostgreSQL**
- **MariaDB**
- **Oracle**
- **Microsoft SQL Server**

CONNECT Storage Engine



3. Key Features of RDS

- **Automated Backups** – Daily backups with point-in-time recovery.
- **Multi-AZ Deployment** – High availability with automatic failover.
- **Read Replicas** – Scale reads horizontally.
- **Automatic Patching** – AWS manages updates and patches.
- **Monitoring** – With **Amazon CloudWatch**.
- **Security** – Encryption (KMS), IAM integration, network isolation (VPC).

Features of Amazon RDS



4. Storage Types

- **General Purpose SSD (gp3/gp2)**: Balanced cost & performance.
- **Provisioned IOPS (io1/io2)**: High performance for OLTP workloads.
- **Magnetic**: Legacy, rarely used.

5. Benefits of RDS

- **Scalability** – Vertical (bigger instance) or horizontal (read replicas).
- **Time-Saving** – No need for manual maintenance.
- **Secure** – Encryption, IAM, VPC isolation.
- **Automated Backups & Snapshots**.
- **Cost-Effective** – Pay for what you use.

6. RDS Deployment Options

- **Single-AZ** – Cheaper, but no failover.
 - **Multi-AZ** – Replication to standby instance in another AZ.
 - **Read Replicas** – For scaling read-heavy workloads.
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7. Common Use Cases

- Web & Mobile Applications.
 - E-commerce platforms.
 - Business applications (ERP, CRM).
 - Data Warehousing (with Aurora + read replicas).
 - Analytics + BI tools integration.
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8. Amazon RDS vs Traditional Database

Feature	Traditional DB (On-Prem)	Amazon RDS
Setup	Manual installation	Few clicks in AWS Console
Backups	Manual, risky	Automated & point-in-time
Scaling	Hardware upgrades	Instant vertical/horizontal
Availability	Admin-managed clustering	Multi-AZ, auto failover
Patching	DBA responsibility	AWS-managed
Cost	CapEx + OpEx	Pay-as-you-go

In short:

Amazon RDS = **Managed, scalable, secure relational database service** that frees teams from admin tasks and lets them focus on application development.

1. Access the AWS Management Console and Navigate to RDS:

- Log in to your AWS account.
- Search for "RDS" in the services search bar and select "RDS".

2. Create a Database:

- Click on "Create database".
- Choose either "Standard create" for more control or "Easy create" for a simplified setup.
- Select your desired database engine (e.g., MySQL, PostgreSQL) and version.
- Choose a template (e.g., Production, Dev/Test, Free tier).
- Configure settings like instance size, storage, and network options.
- Specify database details like name, username, and password.
- Select a VPC and subnet group.
- Finally, click "Create database".

3. Connect to your Database:

- After creation, find the database endpoint and port in the RDS console.
- Use this information to connect to your database from your application or a database client like MySQL Workbench.

4. Managing your RDS Instance:

- RDS handles routine tasks like backups, software patching, and scaling.
- You can monitor performance, configure security, and manage your database through the AWS console.

Key Concepts:

- Database Engine: The specific type of database system (e.g., MySQL, PostgreSQL).
- Instance Class: Determines the computing and memory resources allocated to your database.
- VPC: A virtual private cloud where your database resides.
- Security Group: Controls network access to your database.
- Endpoint: The address used to connect to your database instance

Set up RDS:-

<https://www.youtube.com/watch?v=84PKLR5jsVA>