Virtualization :- Virtualization in cloud computing is a technology that allows the creation of virtual version of computing resources, such as servers, storage, networks, & operating System, from a single physical machine.

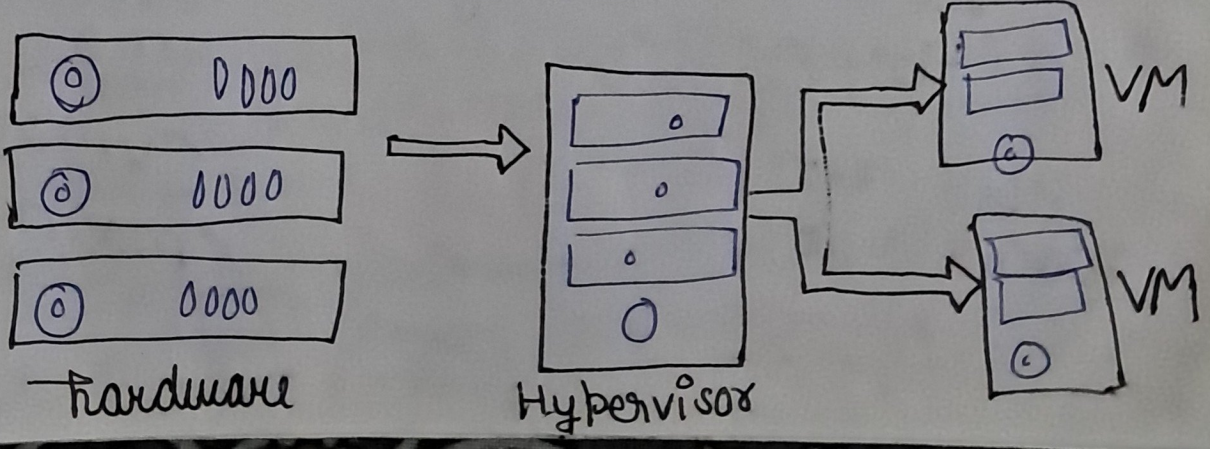
Types of Virtualization :-

1. Hardware Virtualization :- Creating virtual machines (VMs) on a physical server, each with its own operating system.

2. Operating System :- Running multiple operating System on a single machine.

3. Network Virtualization :- Creating virtual network on top of physical networks, allowing for flexible networking configuration.

4. Storage Virtualization :- Aggregating storage resource from multiple physical devices into a single virtual storage pool.



Hypervisor :→ It is software that creates and runs virtual machines (VMs).

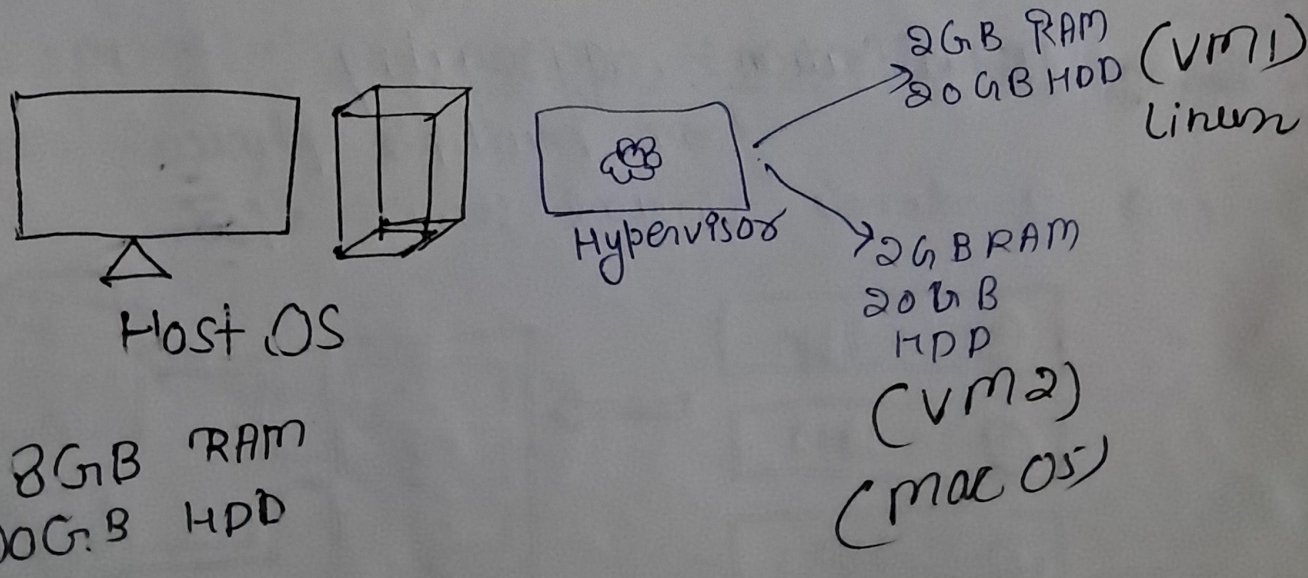
Eg :→ Oracle → Virtual Box

Benefit of VMs

- We don't need new resources to use different OS.
- No risk of any issues with your primary OS.
- Testing any app on different OS.

How Hypervisor works?

- Virtual box share hardware resources from host OS.
- Seperate set of virtual CPU, RAM, storage etc.
- VMs are fully isolated (independent of hosted OS).



Types of Hypervisor

(Type 1)

1. **Bare-Metal** :→ Bare-Metal are installed directly on the physical hardware of the server, acting as a light operating system.

Ex: VMware, ESXi, Microsoft Hyper-V etc.

→ **Advantage** :- High performance, efficiency, strong security, scalable & stabily.

→ **disadvantage** :- More complex to set up and require dedicated hardware.

2. **Hosted Hypervisors (Type 2)** :- These are installed as software application on top of an existing operating system (like windows, macOS, linux).

Ex :→ VMware workstation, Oracle VirtualBox, Parallels Desktop.

→ **Advantage** :- Easy to install, configure and use, suitable of individual users & development environments.

→ **Disadvantages** :- low performance due to the extra layer, security risks & less suitable for enterprises.

(4)

Cloud Computing

On-demand delivery of IT resources over the internet with pay-as-you-go pricing.

→ Access computing resources (like servers, storage, database, and software) over the internet rather than owning and maintaining physical hardware.

Some Cloud Service providers are :→

→ Amazon Web Service (AWS)
→ Microsoft Azure
→ Google cloud platform (GCP)
→ IBM Cloud
→ Oracle cloud
→ Alibaba Cloud.

Note :→ They use Virtualization for the physical hardware system they have, enabling more efficient resource use.

 # Key Benefits

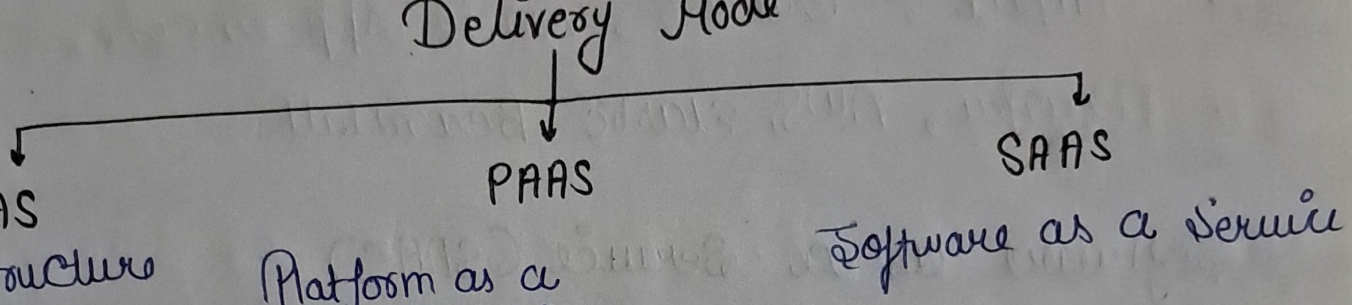
- **Scalable** → Easily handle more users/data.
- **Cost-Efficient** → No need to buy expensive hardware.
- **Accessible** → Use from anywhere.

≐ Reliable :- Auto Backup, uptime, disaster recovery.

≐ Fast Deployement :- Launch apps quickly.

Core :→ use someone else's powerful computer via the internet and pay only for what you use.

⇒ Types of Cloud Computing Services (Delivery Model)



1. IAAS (Infrastructure as a Service) :→

≐ Description :- Iaas delivery on-demand access to fundamental computing resources like virtual machines, storage and networking.

≐ User Responsibility :- Users manage the operating System, storage, applications, and potentially the middleware.

≐ Use case :- Hosting websites, running VMs, storage management.

≐ Examples :- AWS EC2, Microsoft Azure VM, Google Compute Engine.

② Platform as a Service (Paas)

Offer a development environment to build, test & deploy applications without managing the underlying infrastructure.

User Responsibility :- User focus on deploying and deploying applications, while the provider handles the infrastructure & platform management.

Ex :- Github, Docker, Google App Engine, Heroku, AWS, Elastic Beanstalk

3. Software as a Service (SAAS)

Saas delivery ready-to-use applications over the internet, managed and maintained by the Cloud provider.

User responsibility User manage only the data input, output, & providers manage

Everything (app, platform, infrastructure).

Ex :- Salesforce. Dropbox, terabox, zoom, Shopify. microsoft 365.

⑦

Different type of Clould deployement

- **Public Clould** :- A shared clould environment where multiple users can access services over the internet, like AWS or Azure.

- **Private Cloud** :- A dedicated cloud environment for one organization, offering more control & privacy.

- **Hybrid Cloud** :- A mix of public & private, allowing data & application to move blw them for flexibility.

- **Cloud Community** :- Community Cloud where infrastructure is shared blw several organizations from a specific community.

few features commonly offered by Clould providers

- Computer Services
- Storage Services
- Database Service
- Networking Services.
- Serverless Services Computing
- ML Services
- Backup & disaster recovery.
- API Management.

YASH GARG

#AWS

Amazon Web Services

AWS offers a vast range of services, including compute power, storage solutions, networking, database & much more. as we known as cloud service provider.

→ It offers a pay-as-you-go model, allowing you to pay only for what you use, which is ideal for optimizing costs.

#History

→ AWS was launched in 2006 as the first public Cloud platform.

→ Started with Amazon S3 for storage & EC2 for compute power.

Now expanded into offering over 200 fully-featured services across various domains like AI, ML, IoT & more.

#Advantages

Scalability
Reliability
Security
Global Reach

@

Popular Services provided by AWS

- EC2 → for scalable compute capacity
- S3 → for highly reliable storage
- RDS → for manage databases
- Lamda → for serverless computing
- Cloudfront → for content delivery

Scope of AWS

- Cloud Engineer
- Solutions Architect
- Devops Engineer
- Cloud Developer
- Data Engineer
- Cloud Security Specialist
- Machine learning Engineer
- Cloud consultant.
- AWS support Engineer
- SRE (Site Reliability Engineering)

AWS account - Setup

Go to Amazon Services Web (AWS) → free tier account.
→ There are five step
→ Singup for email with verification
→ Make all detail fild properly. (personal detail)
→ fee payment card card detail
→ verification.
→ Select Service (free for learning).

(19) AWS

IAM Service

AWS Identity & Access Management

IAM is a service that helps you securely control access to AWS resources

It allows you to manage users, roles, and permissions to define who can access what within your AWS environment.

#Imp Points:-

- Free Service: IAM is offered at no additional cost
- Global Service: Now user credential is same all over world.
- Root account created by default, should not be used or shared.

#operations of IAM Service

1. Create Users :- You can create individual user accounts for people who need access to your AWS resources.

2. Assign permission:- You can assign specific permission to user, group, or roles to control what actions they can perform on AWS service.

3. Create Groups:- You can group users together and assign permissions to the group, making management

easier for multiple user.

4. Create Roles : You can create roles to assign tempory permissions to AWS services or users, especially usyul for securely managing permissions across different AWS resources.

5. Define Policies : You can create & attach custom policies to define fine grained permissions for controlling access to AWS resources.

6. Manage Federated Access : Establishing trust relationships blw AWS and external identity providers (IdPs). This allows users from your organization's directory (like Actuie Directory) or other trusted sources to access AWS resources using their existing credentials. without needing seperate AWS account or IAM user.

MFA (multifactor Authentication)

MFA is an extra layer of security that requires users to provide two or more forms of verification, like password and a code from their phone, to access their account.

MFA

Username + password + security code

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Ways of accessing AWS

1. The AWS management console provides a graphical, web based approach.

   - Dashboard
   - PowerShell → Terminal

2. The AWS CLI provides a command line scripting approach → for automation purpose.

Additional → AWS SDKs & APIs → Offers programmatic, code based access, allowing users to integrate AWS directly into their applications.

AWS CLI configurations

This is used to access AWS account (caching) services from our local environment. (Command line Interface), .CLI is a unified tool that allows users to manage and interact with AWS services through commands in terminal or command prompt.

1. Install from official website AWS CLI
2. install by allow permission.
3. cmd check AWS, AWS help.

(window-)

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for MAC

Go to the Home brew formulae → AWSCli

Install command `$ brew install awscli` in terminal And setup done

AWS --version → comand same for window & mac

for Accessing IAM in Terminal

1. aws configure in CMD
2. provide secreact key & password
3. provide region then enter 2 times
4. check by aws iam list-users

AWS IAM Best practices

- Avoid using root account except of account setup.
- Add user to a group & assign permission to group.
- Use password policy (make custom also) or MFA (Multifactor authenticcation).
- Use Access keys for CLI / SDK
- Never share Access key or password.
- Audit the permission using IAM credental report as downlodd report.