

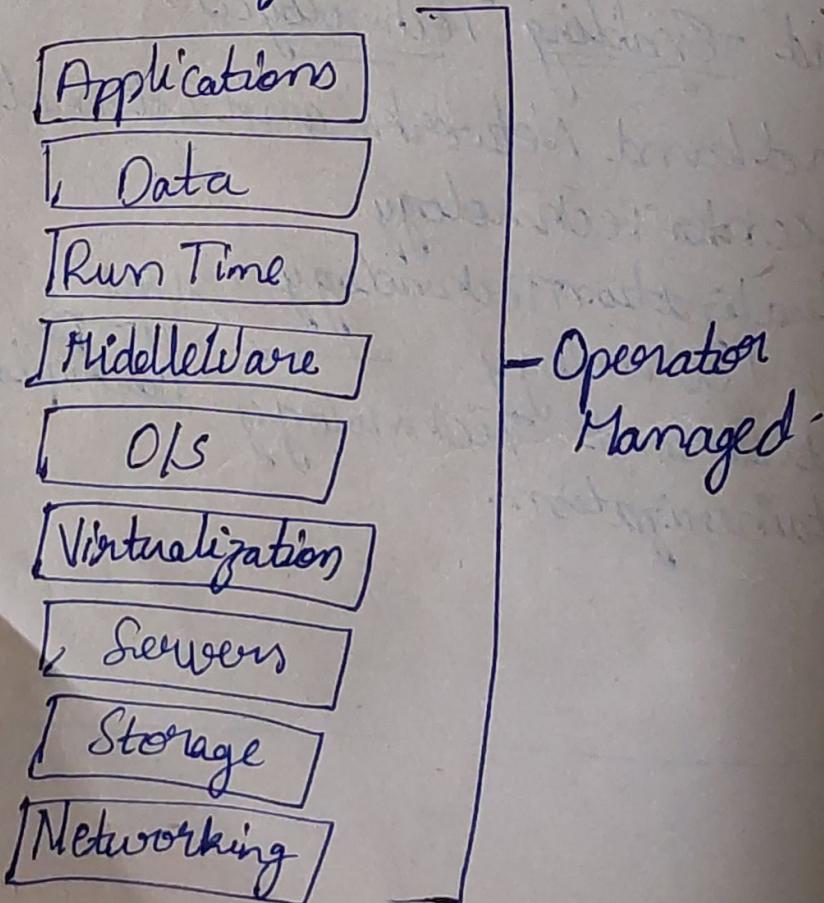
## UNIT-2

### CLOUD SERVICE MODELS

#### Cloud Service Models

##### 1) Software as a Service (SaaS)

- \* SaaS is also known as On-Demand Software.
- \* It is one of the fastest growing concepts.
- \* It is a software in which applications are hosted by cloud service provider.
- \* Users can access these applications using Internet connection and Web browser.
- \* Ex: Google Apps, Salesforce, etc.



## Applications:

- ↳ Billing and invoicing systems.
- \* CRM applications
- \* HelpDesk Applications.
- \* Human Resource Solutions.

## Characteristics:

- \* Managed from a central location.
- \* Accessible over the Internet.
- \* Updates are applied automatically.
- \* Pay-per-Use Basis.

## Advantages:

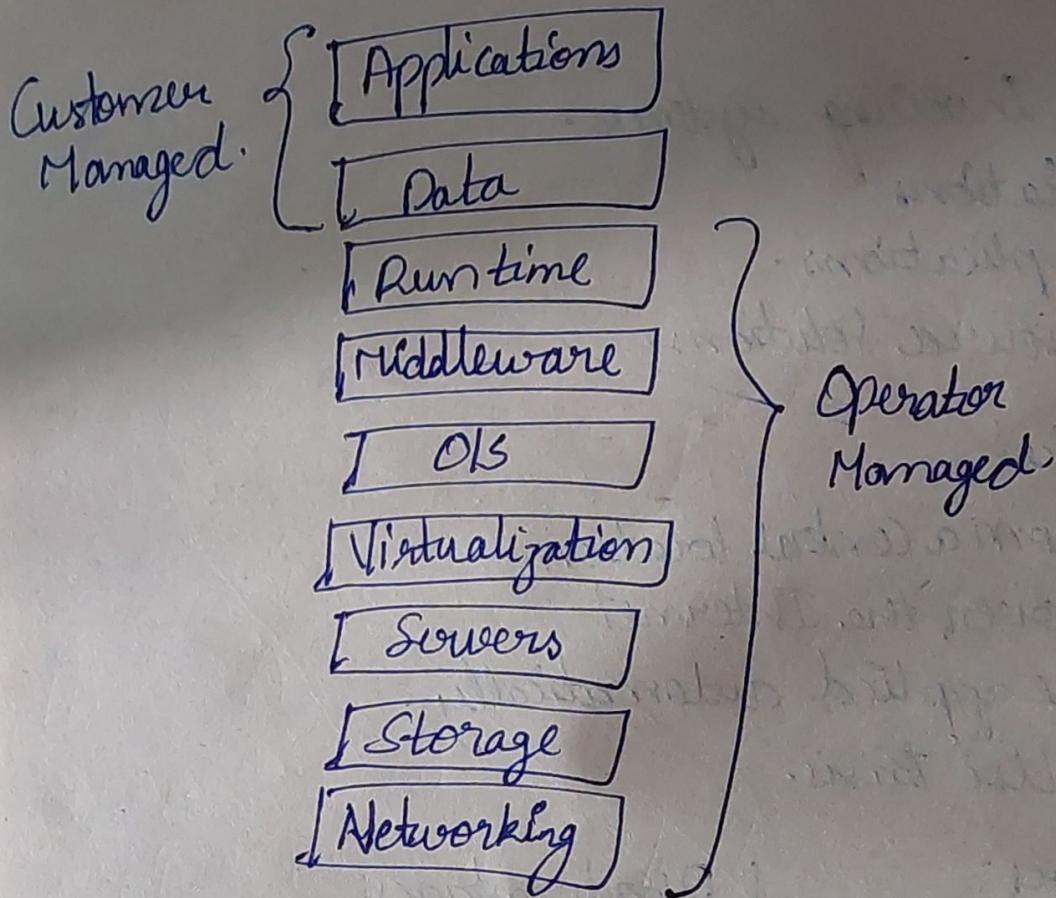
- 1) Scalability.
- 2) Accessibility.
- 3) Easy Upgrades.
- 4) Quick setup.

## Disadvantages:

- 1) Lack of control
- 2) Security & Data concerns.
- 3) Performance.

## Platform as a Service (PaaS)

- \* It is a cloud computing platform that is created for a programmer to develop, test, run and manage applications.
- \* It offers the runtime environment for applications.
- \* It offers development and deployment tools for developing applications.
- \* Ex: Salesforce, Google AppEngine, etc.



### Applications:

- 1) API (Application Programming Interface)
- 2) Business Intelligence.
- 3) Internet of Things.
- 4) Communications.
- 5) Databases -

### Characteristics:

- # supports multiple languages and frameworks.
- # Integrates with Web services and databases.
- # Provides an ability to "Auto-scale".
- # Accessible to various users via some development applications.

## Advantages:

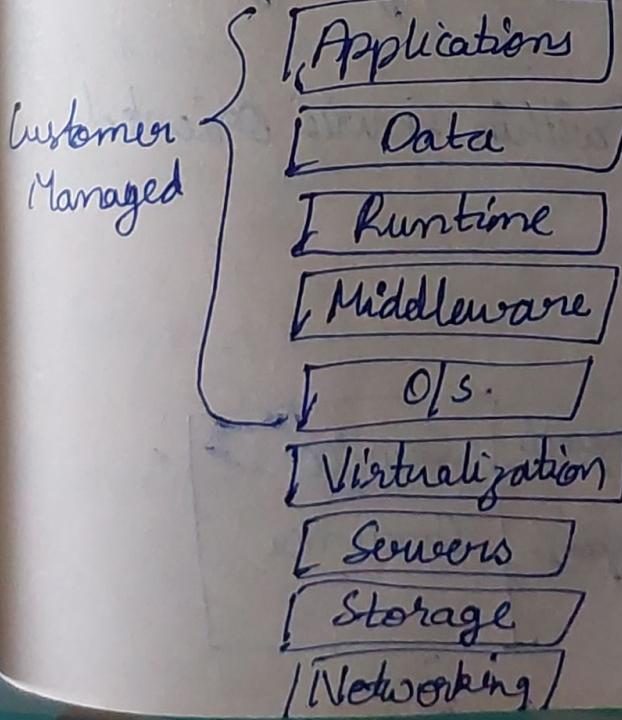
- 1) Lower Risk.
- 2) Simplified development
- 3) Scalability
- 4) Pre-built functionality

## Disadvantages:

- 1) Vendor lock-in
- 2) Data Privacy

## 3) Infrastructure as a Service (IaaS)

- # It is also known as Hardware as a Service.
- # It is a computing platform managed over Internet.
- # It is offered in 3 models:
  - 1) Public
  - 2) Private
  - 3) Hybrid
- # It provides access to fundamental resources such as physical machines, Virtual machines, etc.
- # Ex:- Amazon Web Services, Tata Communications, Reliance Communications.



## Applications:

### Advantages:

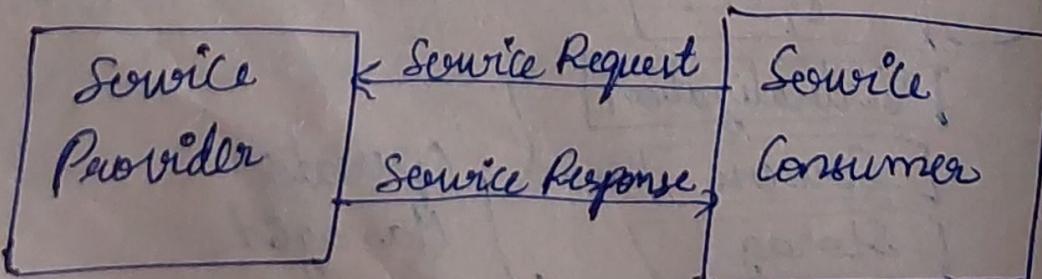
- 1) Shared Infrastructure
- 2) Web Access to Resources.
- 3) Pay-Per-Use Model.
- 4) On-demand Scalability

### Disadvantages:

- 1) Security
- 2) Maintenance & Upgrade
- 3) Interoperability Issues.

## # SOA

- \* SOA stands for Service Oriented Architecture.
- \* SOA is diagram pattern / software architecture which provides application functionality as a service to other applications.
- \* The basic principles of SOA are independent of vendor, products and technologies.
- \* SOA is only a concept.
- \* SOA is not limited to any programming language / platform.
- \* Example: Google Docs.
- \* There are two major roles within Service Oriented Architecture:
  - Service Provider
  - Service Consumer



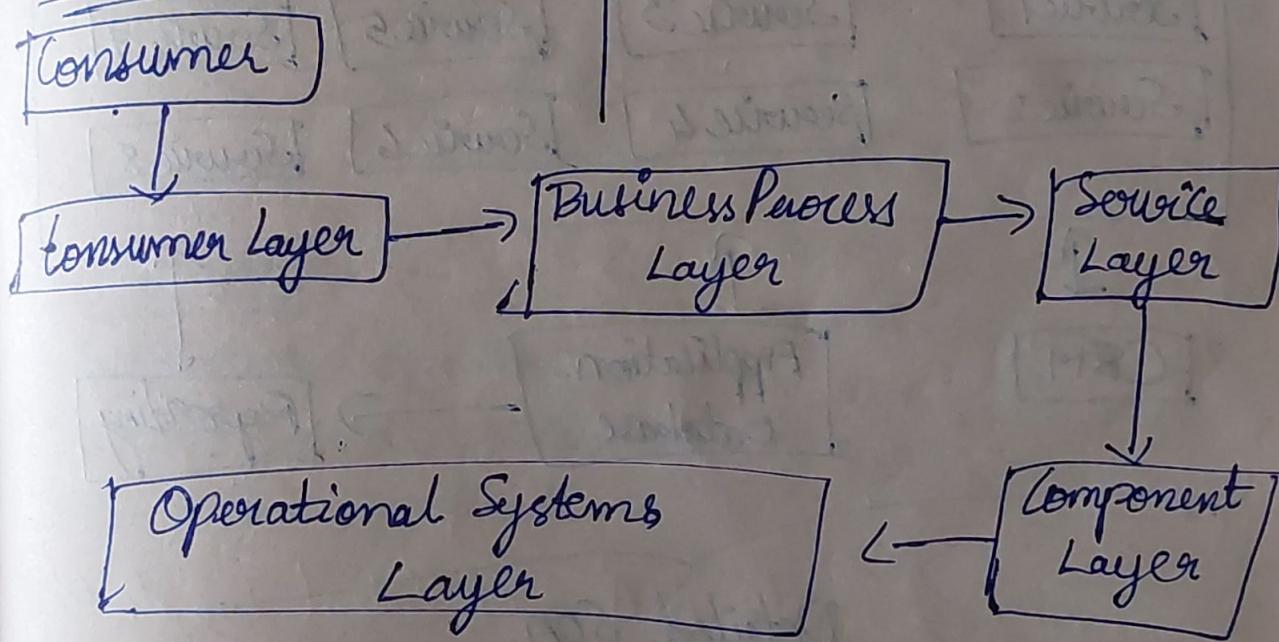
## Advantages:

- Service Reusability
- Easy Maintenance
- Availability
- Reliability.
- Platform Independent

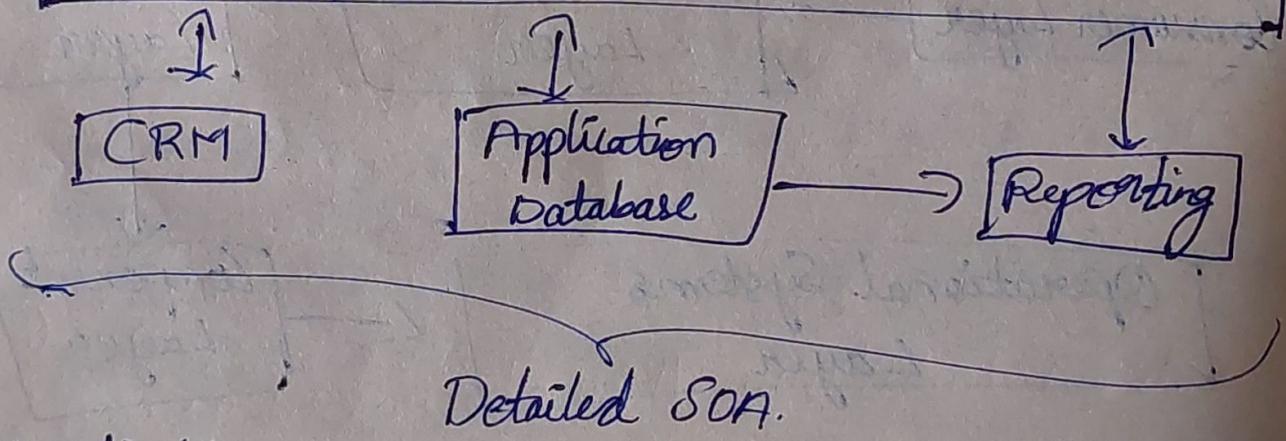
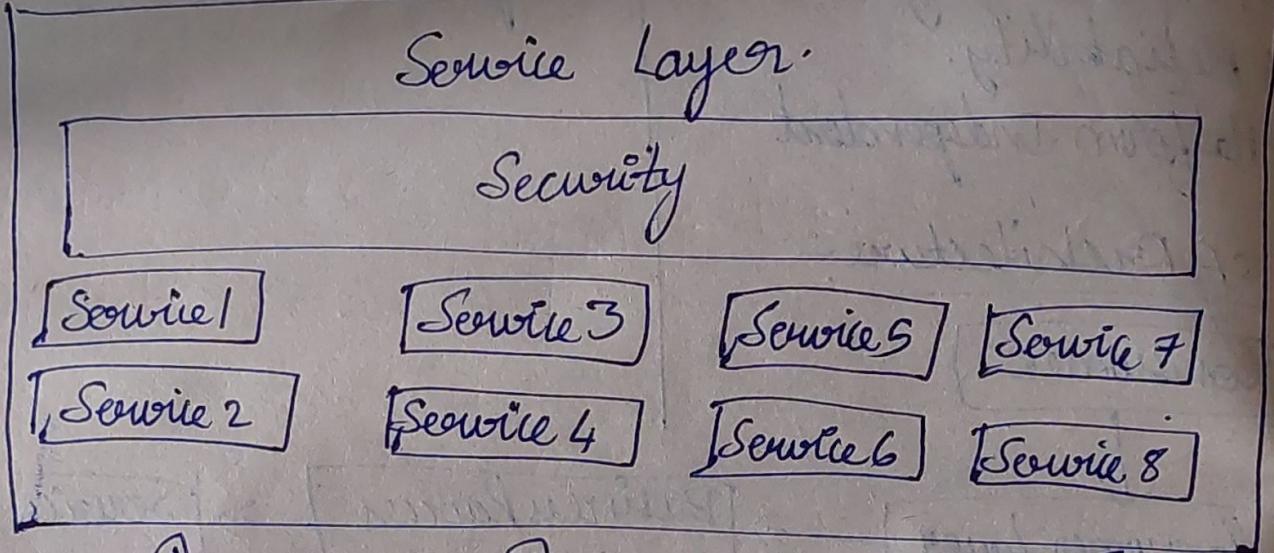
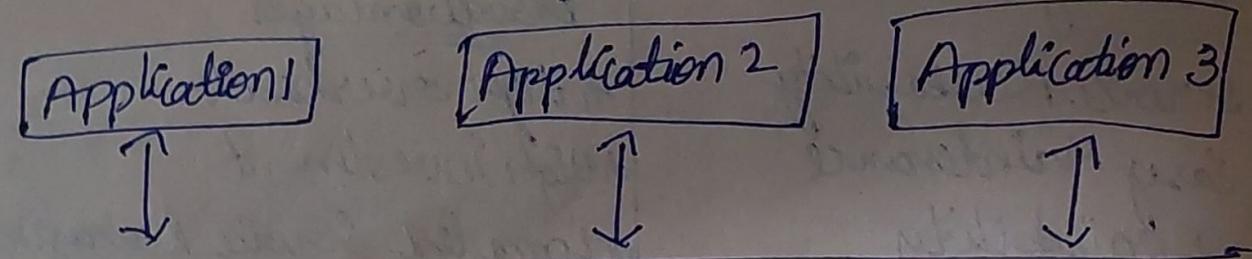
## Disadvantages:

- High overhead.
- High Investment.
- Complex Service Management.

## SOA Architecture:



- 1) Consumer Layer - This layer is used by customer.
- 2) Business process layer - It provides business process flows.
- 3) Service layer - This layer comprises of all services in the enterprise.
- 4) Component layer - This layer has the actual service to be provided.
- 5) Operational System Layer - This layer contains the data model.



### Applications:

- 1) Manufacturing - Eg: Inventory Management
- 2) Insurance - Take up the insurance of the employees in companies.

Companies using SOA are - ICICI Bank  
 - HDFC Bank.  
 - UTI Bank etc.

## Principles:

- Service loose coupling
- Service Reusability
- Service Statelessness
- Service Discoverability.

## Advantages:

- Easy Maintenance
- Greater Reliability
- Platform Independence
- Increased Productivity

## Disadvantages:

- GUI based Applications
- Short lived Applications.
- Real Time Applications.

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## # Elastic Compute Cloud (EC2)

\* Elastic Compute Cloud (EC2) is the engine room of AWS.

- \* It is where servers runs and operate on day to day basis
- \* EC2 provides 'resizable compute capacity'.
- \* EC2 provides the ability to start and stop multiple servers from a single server image.
- \* EC2 is the backbone of architecture where our servers are implemented.

- \* EC2 will not only run our servers but will manage the capacity that they produce.
- \* Remote Desktop Protocol (RDP) is used to login into AMI (Amazon Machine Image).
- \* Elastic Block Store (EBS) is used to store the update made in the image.

### Features of EC2:

#### 1) Reliable:

- \* Amazon EC2 offers a highly reliable environment.
- 2) Designed for Amazon Web Services:
- \* Amazon EC2 works fine with Amazon services like Amazon S3, Amazon RDS, Amazon SQS.
- \* It provides a complete solution for computing, query processing.

#### 3) Secure:

- \* Amazon EC2 works in Amazon Virtual Private Cloud.

Def: Elastic Cloud Computing is defined as the ability of a cloud service provider to swiftly scale the usage of resources such as storage, infrastructure, memory etc; up and down to meet workload requirements dynamically.

(or)

It is a process through which a cloud service provider makes available resources for an organisation on basis of their requirement.

## Benefits:

- 1) Easy Scalability & High performance.
- 2) Cost-efficient
- 3) More Capacity - Unlimited storage capacity is available for business organisations with elastic cloud computing.
- 4) Environment friendly - Cloud is highly environment friendly as it has lesser consumption of resources.

## # ON-DEMAND COMPUTING

- \* On-demand computing is a business computing model in which computing resources are made available to the user "as needed" basis.
- \* In an enterprise system, demand for computing resources varies from time to time. At that point of time on-demand computing is useful.
- \* A cloud provider maintains a pool of resources. This pool of resources contains networks, servers, storage, applications & services.
- \* This pool of services can serve the enterprise with the resource ~~to~~ that demands them at that point of time.

## Benefits

- 1) Flexibility to meet fluctuating demands -
- 2) No need to purchase (or) maintain (or) upgrade service - (servers, hardware)
- 3) User friendly -
- 4) Saves Money.

## # Cloud Service Management

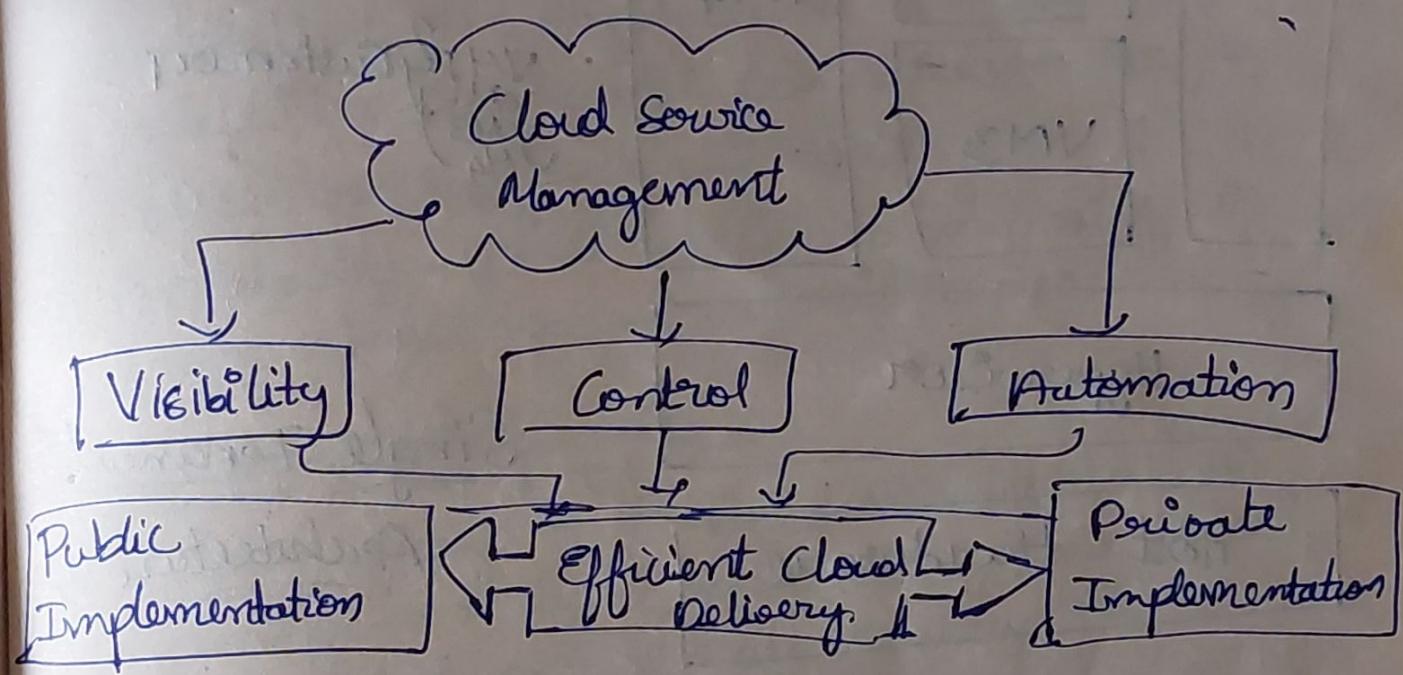
- The management of cloud service products and services is called cloud management.
- Public clouds are operated by public cloud service providers, which provide the servers, storage, networking and data centre operations of the public cloud environment.
- With a third party, ~~not~~ cloud management tool, user can also choose to manage their public cloud services.
- Public cloud services can choose from three categories of cloud provisioning:-

### 1) User self provisioning:

- User can buy cloud services directly from the provider. On pay per transaction basis the client pays.

### 2) Advanced provisioning: Here a monthly fee is charged by the consumer and they need to book it in advance.

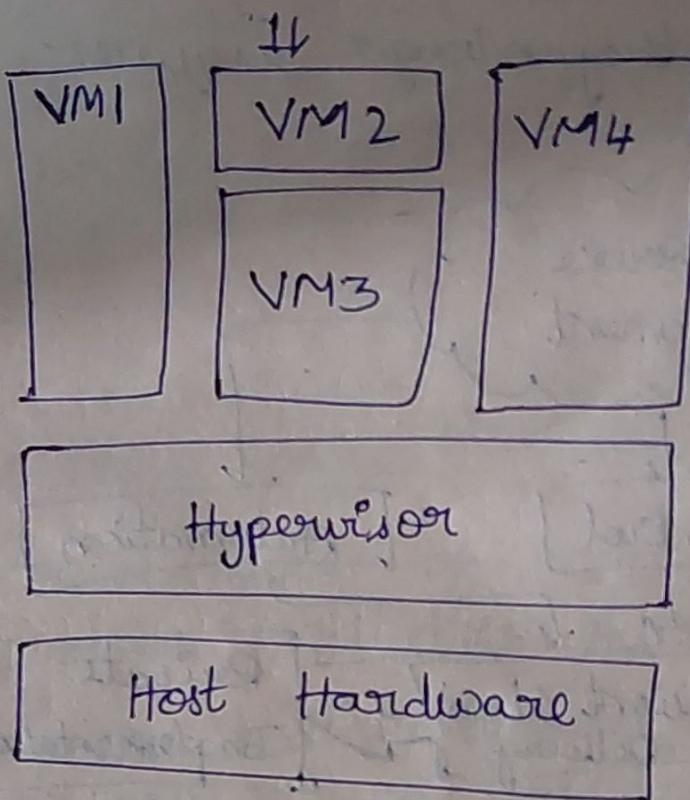
3) Dynamic Provisioning: When a client requires resources, the provider allocates resources and take them off when they no longer require.



### Characteristics:

- Pay-per-Use
- Availability
- Security
- Easy Maintenance
- On Demand Self Service
- Resources Pooling

## # SINGLE TENANT & MULTI TENANT



VM1, VM2, VM3, VM4  
Customer

Single Tenant  
Architecture

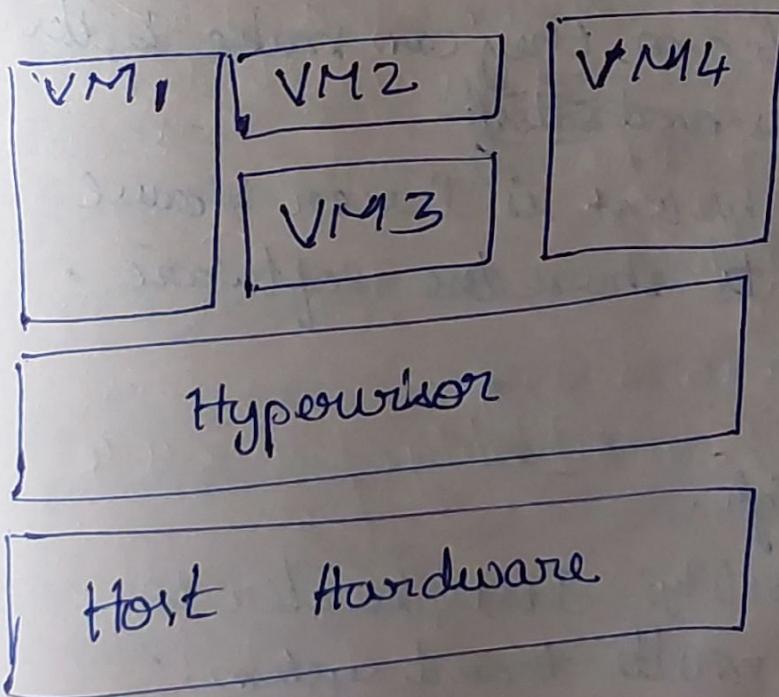
- \* In single tenant architecture it consists of 4 Virtual Machines, Hypervisor , Host Hardware.
- \* These four VM's are operated by a single customer.
- \* Here, single instance of software and infrastructure for each customer.
- \* Independent database for each customer.
- \* It is mostly secure , because it is operated by a single tenant.
- \* Here , the upgrades are to be scheduled by the customer.
- \* The cost of maintenance is high .

## Benefits:

- 1) Data Security
- 2) Customization - More customization options are available in singletenant compared to multitenant because each customer has their own software & hardware.
- 3) Portability - It is easier to migrate data from single tenant architecture.

## Drawbacks / Disadvantages

- 1) Complex Setup - It becomes difficult to manage multiple applications and it is not suitable for small startup teams.
- 2) High Costs - Running a single tenant is more expensive than using shared resources.
- 3) Inefficient Resource Usage -



VM1 - Customer 1  
VM2 - Customer 2  
VM3 - Customer 3  
VM4 - Customer 4

Multi-Tenant  
Architecture

- + In a multitenant architecture, the architecture consists of 4 virtual machines, hypervisor and host hardware.
- + The VM's are operated by different customers.
- + Here single instance of software and infrastructure is shared among multiple customers.
- + This consists of shared database between customers.
- + It lacks security as it is shared by multiple customers.
- + Here, updates are scheduled by the Vendor.
- + Lower cost due to shared resources.
- + Ex:- A user can access facebook account and upload content from multiple devices.  
+ Mostly suitable for small companies - startups.

#### Benefits:-

##### 1) Better Use of resources:

By forming a team, they can make better use of resources.

##### 2) Lower costs?: The cost is lesser because multiple tenants share the software.

#### Drawbacks:-

##### 1) Security Risk is high.

##### 2) Lack of Cost Visibility: It is harder to separate cost in multi-tenant systems.

## # Web Services

- Web services are XML based data exchange systems that use internet for communication & interfacing.
- These processes involves programs, messages, documents & objects.

### Functions:

- Available over Internet (or) Intranet Networks.
- Standardized XML message system.
- Independent of programming language.
- Self describing ~~WS~~ via standardized XML language.

Types: / Components of Web Services: All web services work using following components:-

### XML-RPC (Remote Procedure Call)

- It is the most basic XML protocol to exchange data between a variety of devices on a network.
- It uses HTTP to transfer data & information from client to server.
- + Platform independent way to start with web services.

### UDDI (Universal description, discovery, Integration)

- It is a XML based standard for detailing publishing, discovering web services.
- It is basically an Internet registry for business around the world.
- It communicates via SOAP.
- It is a directory for storing information about web services.

### 3) SOAP (Simple Object Access Protocol).

- \* It is an XML based web service protocol used to exchange data (or) documents using HTTP.

### 4) REST

- \* It is a communication protocol.
- \* It is a format for sending messages.
- \* It is designed to communicate via Internet.
- \* Simple & Extensible.
- \* W3C standard.

### 4) WSDL (Web Service Description Language).

- \* It is based on XML.
- \* It is used to describe Web Services.
- \* It is used to locate Web Services.
- \* It is a W3C standard.

How does Web service works?

- \* A web service enables communication between various applications by using various standards such as HTML, XML, SOAP, WSDL.
- \* It takes the help of -
  - \* XML to tag data.
  - \* SOAP to transfer a message
  - \* WSDL to describe availability of a service.

## Characteristics of Web Services

1) XML-based - It is XML at data representation and transportation layers.

2) Loosely Coupled -

3) Ability to be Synchronous (or) Asynchronous

4) supports RPC's (Remote Procedure Calls)

5) Supports Document Exchange