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Q1

FEATURES	CLOUD COMPUTING	GRID COMPUTING	CLUSTER COMPUTING
BASIC IDEA	Consolidation of resources	Segregation of resources	Aggregation of resources
RESOURCE HANDLING	Both	Distributed	Centralized
SCALABILITY	Yes	Yes	No
NODE CONFIGURATON	Physically in the same location	Distributed geograph-ically all around	Location doesn't matter
SECURITY	Low Medium	Medium High	High
RELIABILITY	Full	Half	No
HETEROGENEITY	Heterogeneous	Heterogeneous	Homogeneous
VIRTUALIZATION	Yes	Half	Half
COST	Low	High	Very High
MULTITENANCY	Yes	Yes	No
IMPLEMENTATION	Difficult (host)	Difficult	Easy
EXAMPLES	Dropbox, Gmail, Facebook, Amazon Web Services (AWS) and Adobe Cloud	IBM, Darktrace, Gigaspace, Atos and Hazelcast.	Google Search Engine, Weather Forecast system and earth-quake simulation

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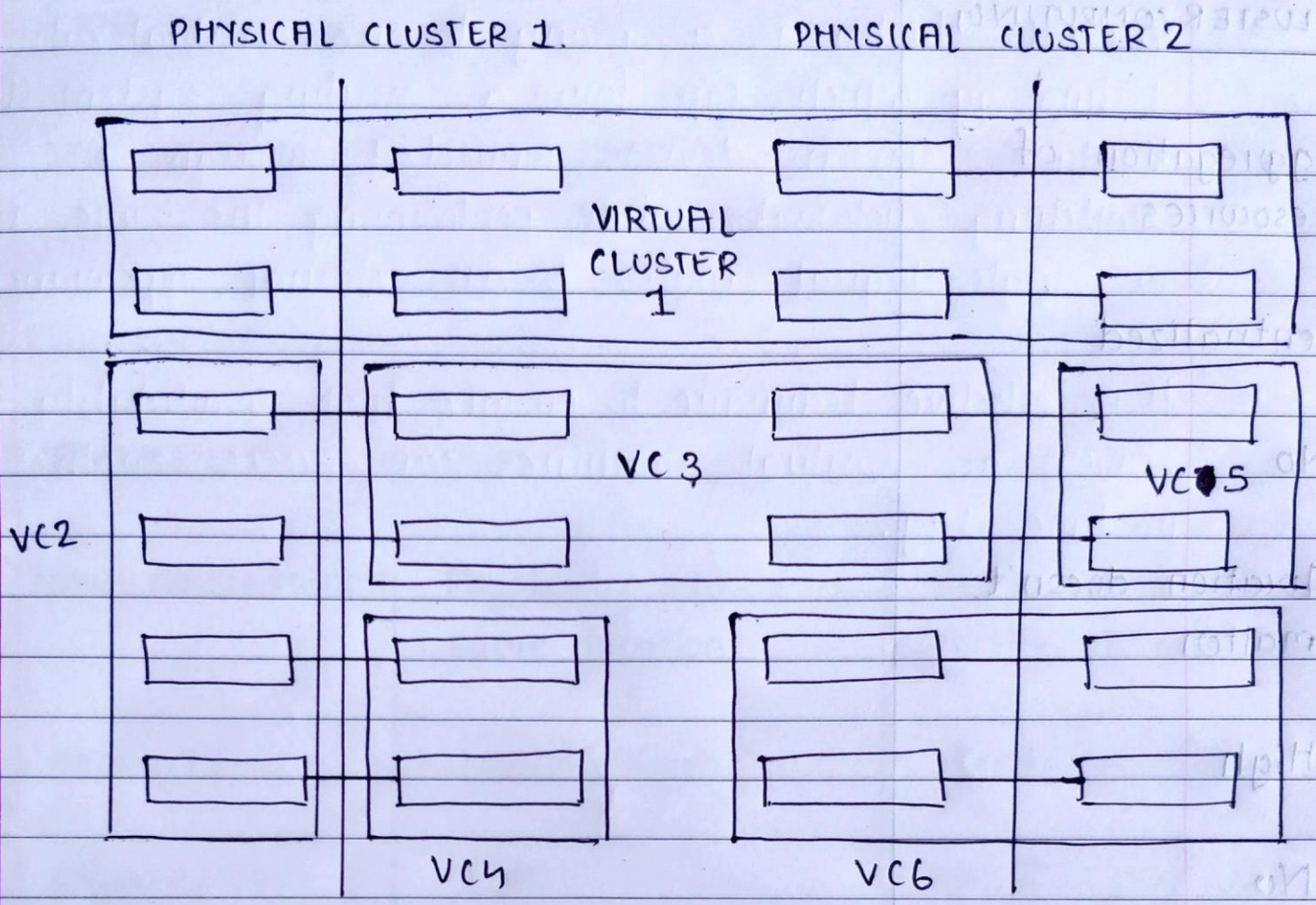
Q4.



→ Each physical cluster consists of a number of interconnected servers & VM represented by rectangle here

→ The VM are implemented on the servers / physical machines

→ Each virtual cluster can be formed with VM hosted by multiple physical address clusters on physical machines

→ The boundaries of virtual clusters are also shown in the diagram

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→ Virtual cluster is a many to one virtualization technology which can form a routing system from multiple common devices connected through a switching network, while performing the same as a single logical router to all external appearances

→ It is effective technique to ensure high availability of servers as virtual machines can access another with no time lag.

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Q5. A cloud architecture in which virtual servers are given direct access to block based storage LUNs.

TRUE

Let's take a scenario of overcoming performance, limitations impaired by emulated file based storage.

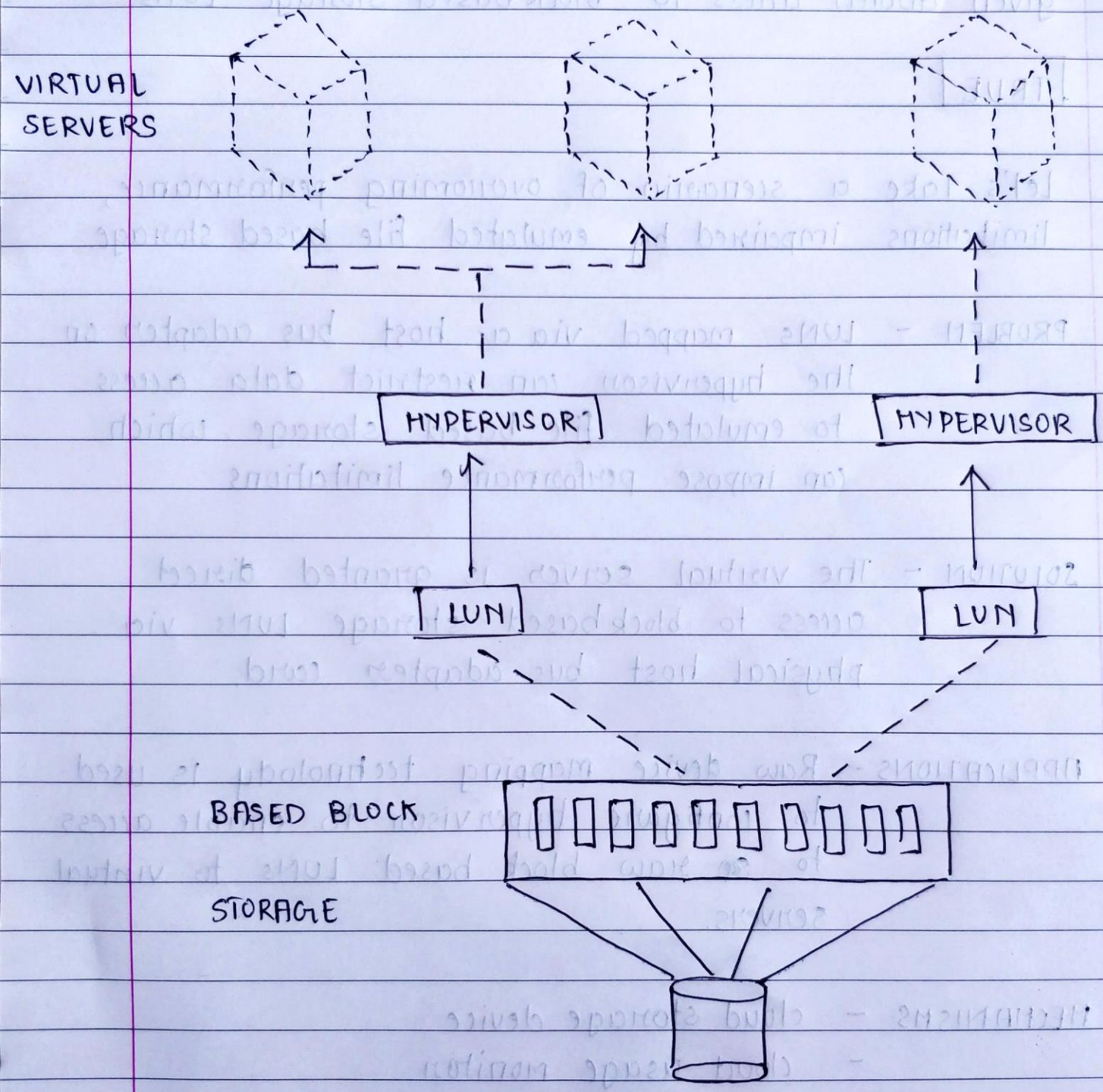
PROBLEM - LUNs mapped via a host bus adapter on the hypervisor can restrict data access to emulated file based storage, which can impose performance limitations

SOLUTION - The virtual server is granted direct access to block based storage LUNs via physical host bus adapter card.

APPLICATIONS - Raw device mapping technology is used to configure hypervisor to enable access to raw block based LUNs to virtual servers.

MECHANISMS - cloud storage device
- cloud usage monitor
- hypervisor
- pay per use monitor
- resource allocation and virtual server
- virtual infrastructure management

Here is the prepared diagram for the solution:



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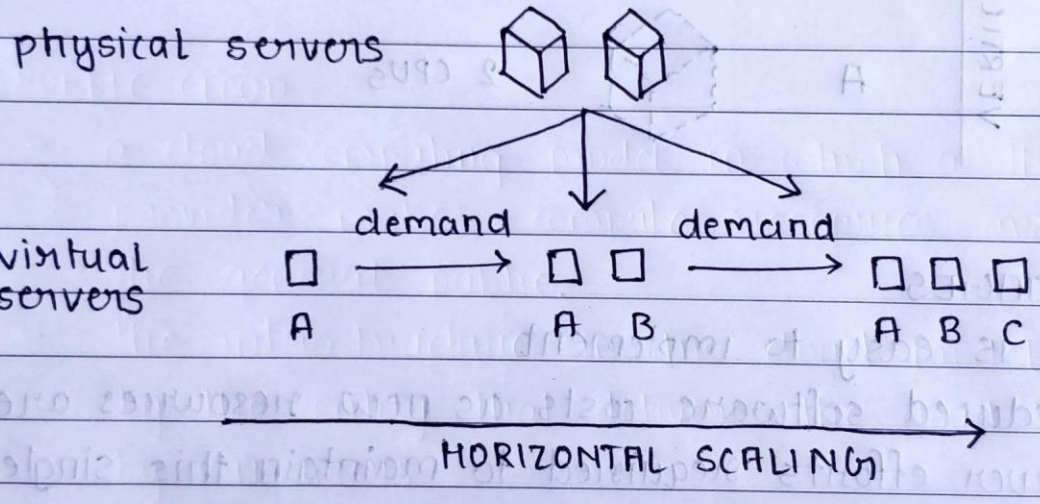
Q6. Scaling from an IT resource perspective is the ability of the IT resources to handle increased and decreased usage demands.

HORIZONTAL SCALING - scaling out and in
VERTICAL SCALING - scaling up and down

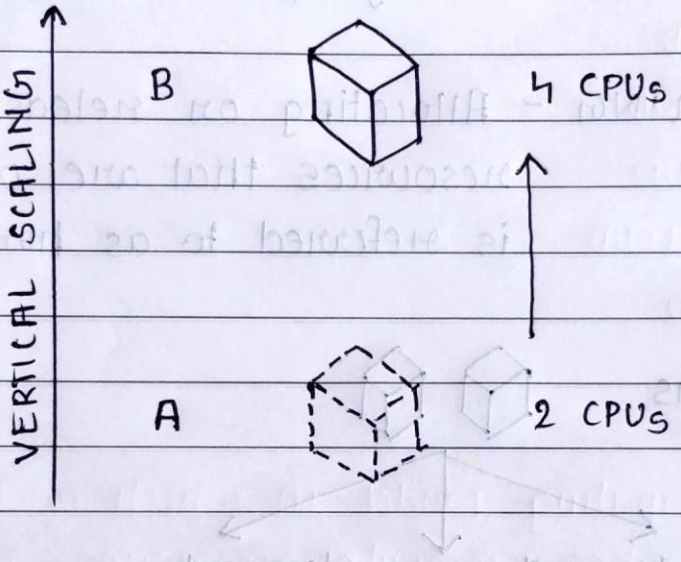
1. HORIZONTAL SCALING - Allocating or releasing of IT resources that are of same type is referred to as horizontal scaling



ADVANTAGES
- ↳ fault tolerance
- ↳ low latency
- ↳ built in backup

DISADVANTAGES
- ↳ cost is high
- ↳ not easy to implement
- ↳ network components like router & load balancer are required

2. VERTICAL SCALING - When an existing IT resource is upgraded or replaced by another with higher or lower capacity, then vertical scaling is considered to have occurred.



ADVANTAGES
- ↳ It is easy to implement
- ↳ reduced software costs as new resources are added
- ↳ fewer efforts required to maintain this single system

DISADVANTAGES
- ↳ single point failure
- ↳ downtime is high when system fails
- ↳ high risk of hardware failures

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Q1. → Here we have four data centers according to the question. Basically the development team wants to scale the services automatically based on traffic across multiple servers of the bank.

→ Now, for the given scenario I would suggest to implement a good load balancing architecture for the servers to ensure that no single server has to bear too much load or all the network traffic on its own. Either it shows get distributed over different bank servers & provide stable services.

→ load balancing is basically efficiently distributing the incoming network traffic across a group of servers also known as server farm. It reduces the response time & increases the throughput & also speed up services for each user.

→ We will have a load balancer for the 4 banks servers which will route the requests across the servers which are capable of fulfilling those requests in manner to maximize the response capacity & maximize response time. If a single server goes down then also system will work as load balancer will forward the requests to other servers.

→ With the help of load balancer we can also add extra servers in future without complexity. With the help of load balancing system will be available 24×7 to serve efficiently

→ Load balancing is also easy to implement for experienced network admins. Balancer will also detect the dead servers which help admins to restart them.

→ Also it is mentioned that the application responsiveness should not be compromised. So, if we use load-balancer then it will not only ensure the responsiveness but also improve it by distributing traffic to different servers.

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Q.3 When building out a cloud strategy there are several in-depth steps that must be taken to ensure a robust infrastructure

- RELIABILITY, AVAILABILITY & SECURITY
- SERVICE MANAGEMENT
- RESOURCE MANAGEMENT
- INTEGRATION WITH DATA CENTRE MANAGEMENT TOOLS
- VISIBILITY & REPORTING
- INTERFACES FOR USERS, ADMINS & DEVELOPERS

1. RELIABILITY, AVAILABILITY AND SECURITY

- To be fully reliable and available, the cloud needs to be able to continue to operate while data remains intact in virtual data center regardless if a failure occurs in one or more components

- Additionally since most cloud architecture deals with shared resource pools across multiple groups both internal and external, security and multi-tenancy must be integrated into every aspect of an operational architecture and process

- Services need to be able to provide access to be able to access only authorized users and in this shared resources pool model the users need to able to trust that their data and application are secure.

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2. INTEGRATION WITH DATA CENTER MANAGEMENT TOOLS:

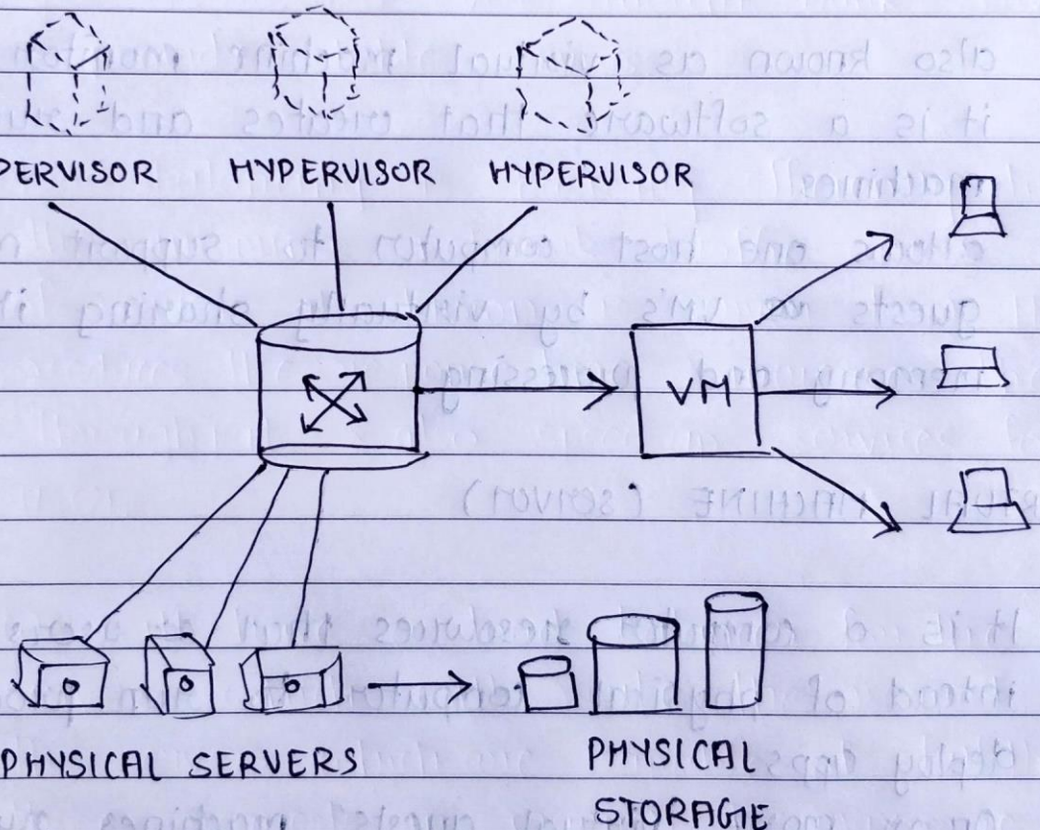
- Most data centers utilize a variety of IT tools for systems, management, security provisioning, customer care, billing and directories, among others. And these work with cloud management service and open API's to integrate existing operation, administration, maintainance & provisioning system.

- A modern cloud service should support a data center's existing infrastructure as well as levaraging software, hardware and virtualization and other technology.

- Many components of traditional data center management still require some level of integration with new cloud management solutions even though the cloud is a new way of consuming IT.

Q4. Common components of Data centers

- A data centers is a physical facility that organisations use to house their critical applications and data
- A data center's design is based on network of computing and storage resources that enable the delivery of shared applications and data
- It consist of both physical and virtualized IT resources



→ Virtualized components that are easier to allocate, operate, release, monitor and control.

→ Data center design also includes switches, firewalls, servers and applications.

→ PHYSICAL SERVERS

- also known as 'bone-metal-server'
- it is a single tenant computer server, meaning that a specifier physical server is designated to a single users.
- resources and components are not shared among multiple users.

→ HYPERVISOR

- also known as virtual machine monitor
- it is a software that creates and runs virtual machines
- allows one host computer to support multiple guests VM's by virtually sharing its resources, memory and processing..

→ VIRTUAL MACHINE (server)

- It is a computer resources that users softwar- intead of physical computer to run programs & deploy apps
- On or more 'virtual guests' machines run on a physical host machines.

→ PHYSICAL STORAGE

- includes devices like external HDD, SD cards, flash drives etc.-

Q5 The cloud deployment model identifies the specific type of cloud ~~computing~~ environment based on ownership, scale and access, as well as the cloud's nature and purpose.

Common deployment models of cloud are as follows :

- PUBLIC CLOUD
- PRIVATE CLOUD
- HYBRID CLOUD
- COMMUNITY CLOUD
- MULTI CLOUD

→ PUBLIC CLOUD

- a cloud computing model in which a third party provider makes compute resources available to the general public.
- the infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by consumers
- It allows customers and users to easily access systems and services.

For example, Google App Engine, Amazon EC2, IBM and Salesforce Heroku.

This services provider provides the resources and services that can be used by general public according to their requirement.

ADVANTAGES

↳ High Scalability

↳ No maintanance

↳ Minimal Investment
↳ No infrastructure management

DISADVANTAGES
↳ Compromised Reality
↳ Data Security and privacy issues given rise to concern
↳ The lack of bespoke service
↳ Reliability issues
↳ Servile / License Limitations

→ HYBRID CLOUD
- As the name suggest, hybrid cloud is a combination of two or more cloud architecture
- by bridging the public and private worlds with a layer of proprietary software, it gives best of both the worlds.
- organizations can move data and applications between different clouds using combination of two or more cloud deployment methods.
- It not only safegaurds and controls strategically important asset but does so in cost and resources effective way.

For example, Amazon Web Service (AWS), Microsoft Azure. This providers balance its load by locating mission-critical workloads on a secure private cloud and deploying less sensitive ones to a public one.

ADVANTAGES

↳ Flexibility and control
↳ Cost
↳ Security
↳ Improved privacy

DISADVANTAGES

↳ Complexity
↳ Specific Use Case

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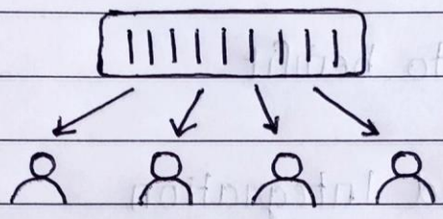
Q6. MULTITENANT ARCHITECTURE :

- It is commonly referred to as multitenancy, is a software architecture in which multiple single instances of software run on a single physical server.
- It is used to enable multiple user a single application for instance a database.
- Multitenant architecture is a feature in many types of public cloud computing



Multi-tenant architecture, commonly referred to as multitenancy used in cloud computing, to offer shared tenancy on public cloud providers like AWS, Microsoft Azure and Google Cloud.

SAAS ARCHITECTURE :

- saas architecture refers to a method of software delivery, in which a vendor hosts an application on a remote server for an organization before delivering the app's capabilities to that organization's users over the internet
- This model allows multiple companies or organization to share a single model and a single configuration.
- This means that these organizations access the same hosted application.

- With this model, a single version of the application with a single configuration used for all the customers
- In the traditional model, each version of the application is based on a unique code.
- Some saas solutions do not use multitenancy, to cost effectively manage a large number of customers in place.

ADVANTAGES OF SAAS:

- Reduced time to benifit
- Lower costs
- Scalability and Integration
- Easy to use and perform proof of concepts

APPLICATION OF SAAS:

- IT Security
- CRM (Customer Relationship Management)
- ERP (Enterprice Resource Planning)
- Team Collaboration
- Marketing automation
- E-invoicing
- Content Planner
- Gamification
- Virtualization
- Messaging softwares
- Accounting