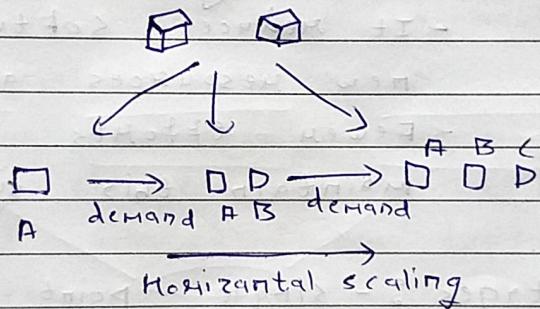


A. Q1) Scaling from an IT resource perspective is the ability of the IT resource to handle increased & decreased usage demands.

b) Horizontal scaling or Scaling out & in. Allocating or relocating IT resource that are of some type is preferred to as horizontal scaling



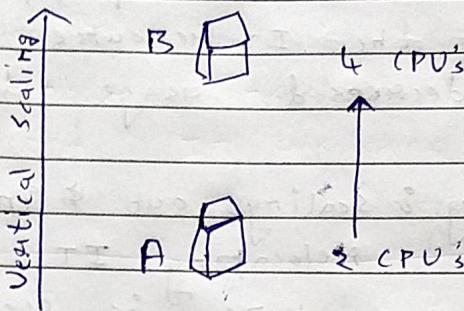
Advantages:- Fault tolerance

- low latency
- Built in backup

Disadvantages:- High cost

- Not easy to implement
- Network components like routers & load balancers are required

c) Vertical scaling or Scaling up & down. When an existing IT resource is upgraded or replaced by another with higher or lower capacity, then vertical scaling is considered to have occurred.



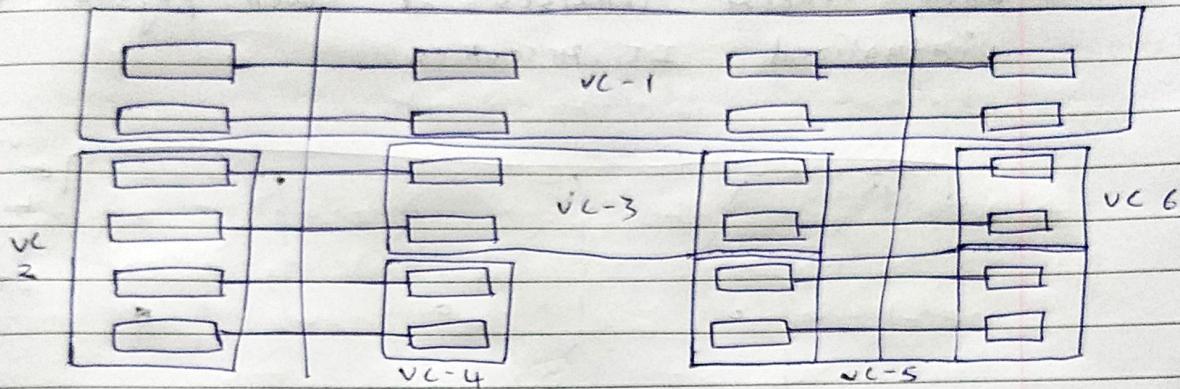
Advantages :-

- It is easy to implement
- It reduces software cost as new resources are added
- Fewer efforts required to maintain this system

Disadvantages :-

- single point failure
- Downtime is high when system fails
- High risk of hardware failure

Q. 02)

Physical
cluster 1Physical
cluster 2

Here VC - Virtual cluster.

- Each physical cluster consists of a number of interconnected servers & VM represented by rectangles here.
- The VM are implemented on the servers (physical) machines
- The boundaries of virtual clusters are also shown
- 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 machine can access another mode with no time lag.

A. Q5)

	cluster	grid	cloud
Basic Idea	Aggregation of resources	Segmentation of resources	Consolidation of resources
Resource Handling	Centralized	Distributed	Both
Scalability	No	Yes	Yes
Node Configuration	Physically in same location	Distributed geographically	Location doesn't all over the globe
Security	High	Medium-High	Low-Medium
Reliability	No	Half	Full
Heterogeneity	Homogeneous	Heterogeneous	Heterogeneous
Virtualization	Half	Half	Yes
Cost	Very High	High	Low
Multitenancy	No	Yes	Yes
Examples	Google service Engine, weather forecasting system	IBM, Gigaspaces	Gmail, AWS

A. Q1) True. A cloud architecture in which virtual servers are given direct access to block-based storage LUNs.

Let's take a scenario of upcoming performance limitations imposed by emulated file-based storage.

Problem : LUN's mapped via a host bus adapter data access to emulated file-based storage, which can impose performance limitations.

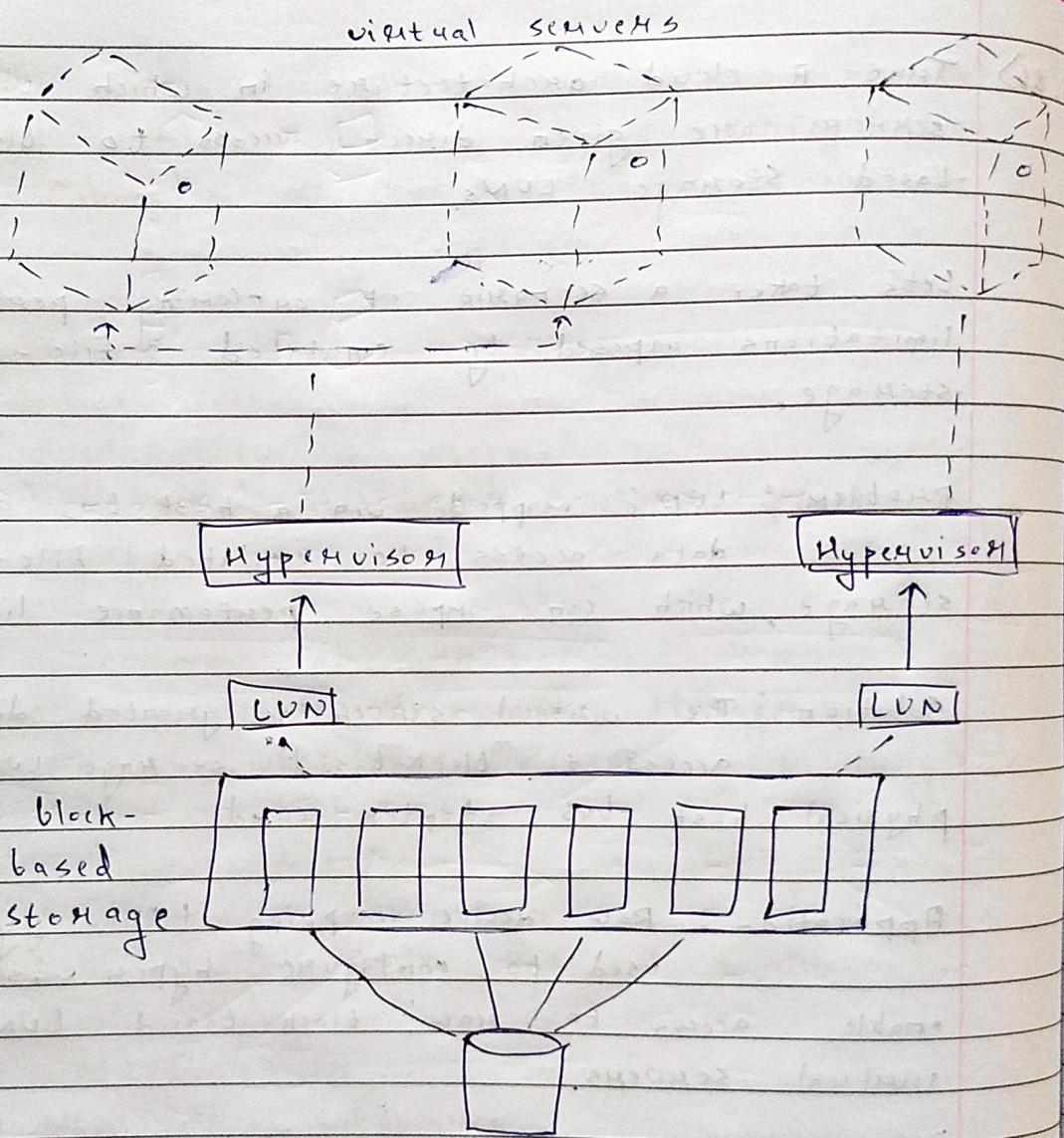
Solution : The virtual server is granted direct access to block-based storage LUN's via physical host bus adapters card.

Application : Raw device mapping technology is used to configure hypervisor to enable access to raw, block-based LUN's to virtual servers.

Mechanisms :-

- Cloud storage device
- cloud usage monitor
- Hypervisor
- Pay per-use monitor
- Resource allocator & virtual server
- Virtual infrastructure Management.

→ Find proposed diagram for the solution in next page.



B. Q1) According to question we have 4 data centers. 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 should 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 speeds up services for each user.

→ We will have a load balancer for the 4 bank servers which will route the requests across the servers which are capable of fulfilling those requests in manner to maximize the response capacity utilization & minimize 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 balancing 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 balance will also detect the dead servers which help admins to restart them.

B. Q2) Common cloud deployment Models :-

- 1) Public cloud
- 2) Private cloud
- 3) Hybrid cloud
- 4) Community cloud

D) Public clouds:-

- They are available to general public & data are created and stored on third-party servers.
- It is the first choice for business with low privacy concerns.
- Server infra. belongs to service providers that manage it & administer pool resources, which is why there is no need of user companies to buy and maintain own hardware.
- Provider companies offer resources as service both free of charge or pay-as-use basis. User can scale resources as required.

Advantages - Hassle free infra. management

- High scalability
- Reduced cost

Disadvantages - Compromised reliability

- Security & privacy issue
- Lack of service.

Ex: Amazon, EC2, Microsoft Azure, IBM cloud, etc.

2) Private clouds -

- They are owned by private companies & org. The server can be hosted externally or inside the company but the access is only to limited people.
- Permissions are designed with the help of software & hardware.
- Private cloud provides wide opportunities for customizing infra. as companies requirements.

Advantages - Flexible development

- High scalability
- High security & privacy
- Access permissions

Disadvantages - High cost

- Not for small companies.

Ex: Cisco, Dell, RedHat, etc provide this service.

B. Q3) Components required as prerequisite on which cloud computing is built are -

- 1) Resource & Service Management
- 2) Dynamic Workload & Resource Management
- 3) Reliability, Availability & security
- 4) Integration with data center management
- 5) Administrator, Developer & end user interface.

=> Reliability, Availability & security

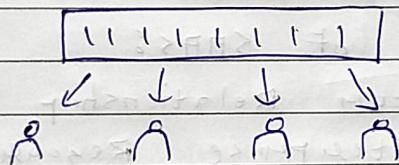
- To be fully reliable and available, the cloud needs to be able to continue to operate while data remains intact in virtual data centers regardless if a failure occurs in one or more components.
- Additionally since most cloud architecture deals with shared resource pool across multiple groups both internal and external security and multi-tenancy must be integrated into every aspect of an operational architecture & process
- Services need to be able to provide access to only authorized users and in this shared resource pool model the users need to be able to trust that their data & application are secure.

⇒ Integration with data center Manag. 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 existing operation, administration, maintenance & provisioning system.
- A modern cloud service should support a data center's existing infrastructure as well as leveraging software, hardware & virtualization & other technology.

B.Q4) 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 users a single application. For instance a database.
- It is a feature in many types of public cloud computing.



- It is used as in cloud computing, to offer shared tenancy on public cloud providers like AWS, Microsoft Azure.

=> SAA Architecture :-

- It refers to a method of software delivery in which a vendor hosts an application on a remote server for an organisation before delivering the app's capabilities to that organisation's users over the internet.
- This model allows multiple companies of organisation to share a single model & a single configuration.
- This means that these organisations access the same hosted application.

- with this Model, a single version of the application with a single configuration used for all the customers.

Advantages :-

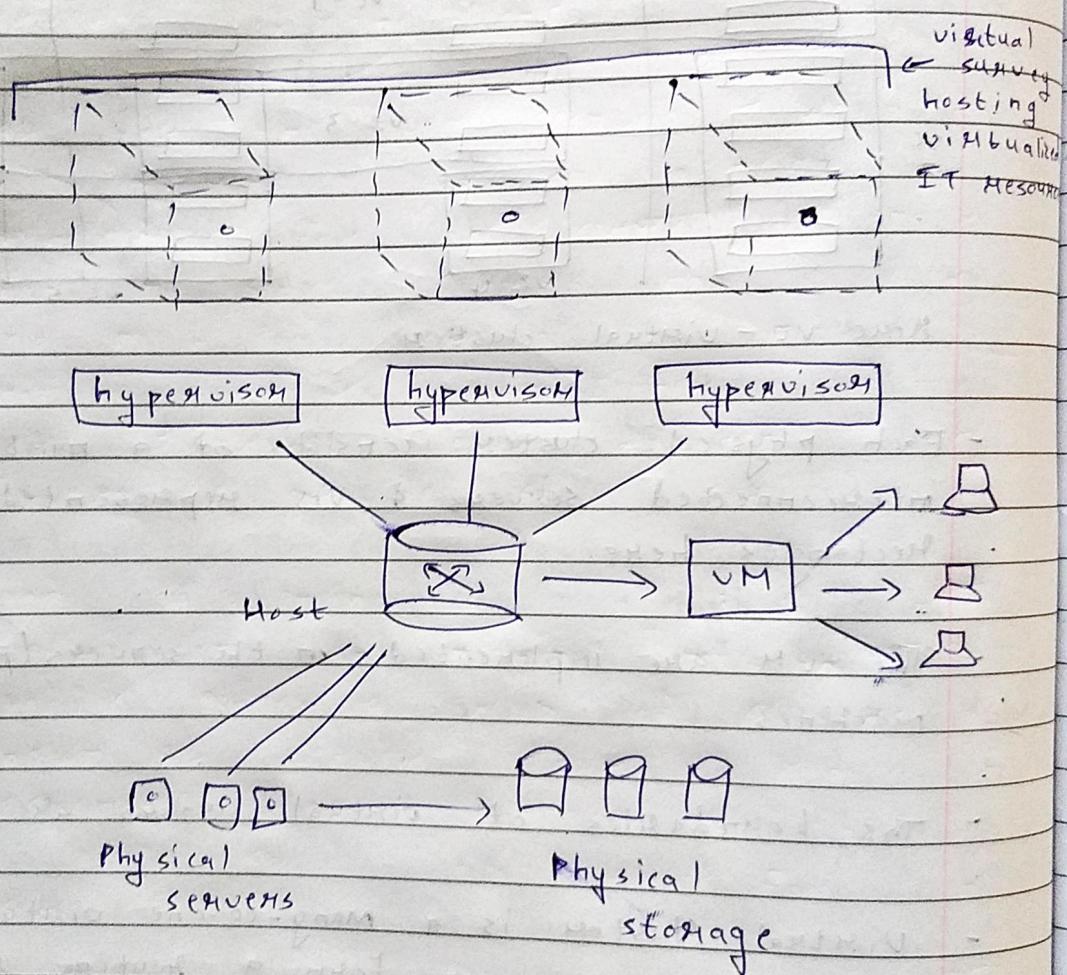
- Reduced time to benefit
- lower costs
- Scalability & integration
- Easy to use and perform proof of concepts.

→ Application of SaaS :-

- CRM (Customer Relationship Management)
- ERP (Enterprise Resource Planning)
- Team collaboration
- IT security
- Marketing automation
- E-invoicing
- Gamification
- Virtualization
- Messaging softwares
- Accounting
- Content planning

B.Q6) Data Center Working:

- Data center consists of both physical & virtualized IT resources



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

- # Physical Server Also known as base-Metal-Server
- It is a single-tenant computer server, meaning that a specific physical server is designated to a single user.

- 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 guest VM's by virtually sharing its resources, memory & processing.

Virtual Machine - (Server)

- It is a computer resource that uses software instead of physical computer to run programs and deploy apps.
- One or more "virtual guest" machines run on a physical host machine.

Physical storage:

- Includes devices like external HDP, SD cards, SSD's, Flash drives.