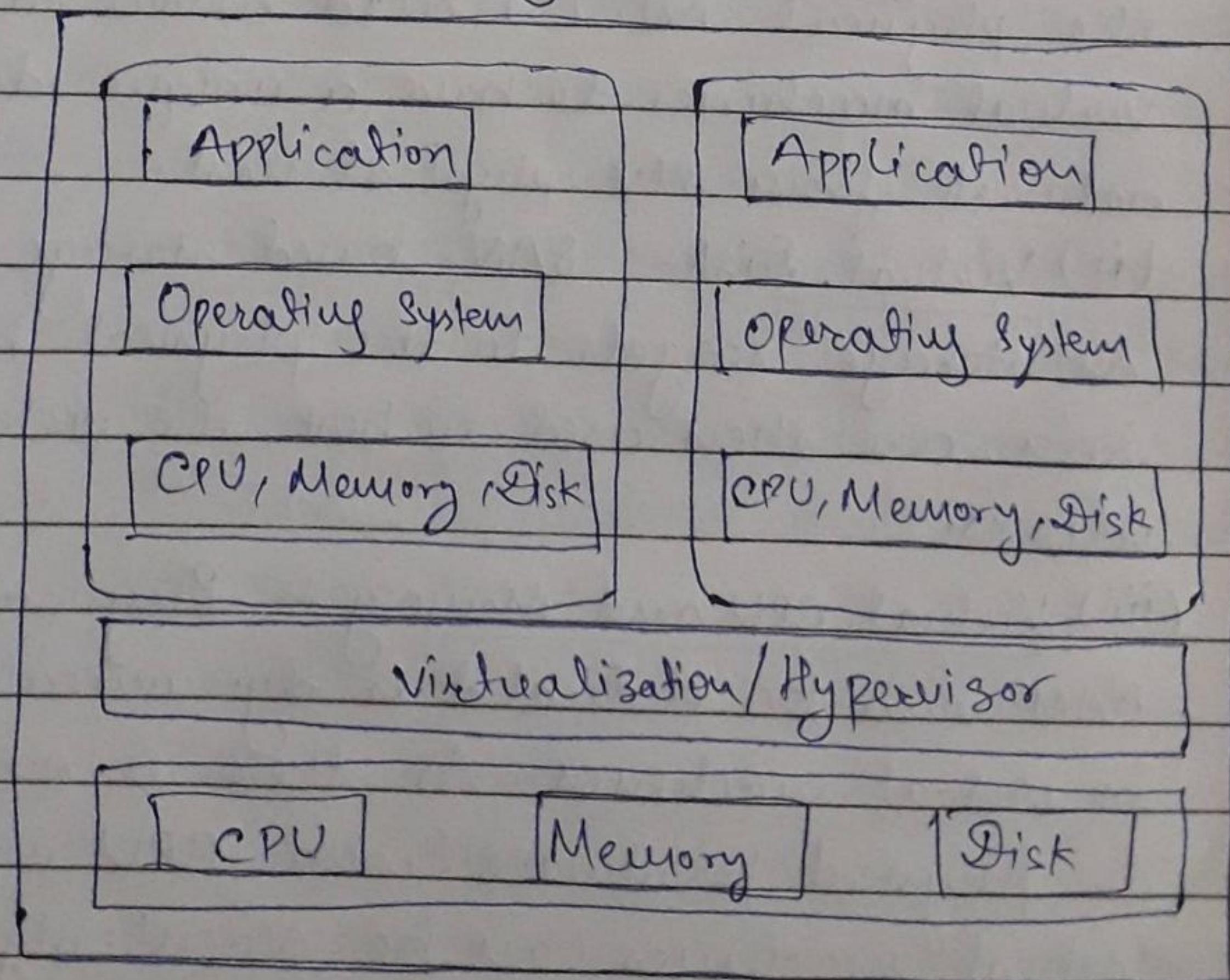


- (1.) Define virtualisation . with neat diagram explain server virtualization .
- ⇒ Virtualisation is an abstraction layer (hypervisor) that decouples the physical hardware from the operating system to deliver greater IT resource utilization and flexibility. It allows multiple virtual machines, with heterogeneous operating systems to run in isolation , side-by-side on the same physical machine.

Server Virtualization:- It is the process of dividing a physical server into multiple unique and isolated virtual servers by means of a software application. Each virtual server can run its own operating systems independently.



Server Virtualization

A virtual machine is a server environment that does not

physically exist but is created within another server. In this context, a VM is called a 'guest' while the environment it runs within is called a host. One host environment can usually run multiple VMs at once.

A hypervisor virtualizes a server with architecture into multiple virtual machines. Each VM is a virtualized server with its assigned system resources and an operating system.

(2.) Explain current virtualization initiatives.

⇒ Current virtualization initiatives :-

(i) Virtual Networking:- This creates a virtual 'network in a box' solution that allows the hypervisor to manage virtual machine network traffic through the physical NIC(s) and allow each of the virtual machines to have a unique identity on the network from the physical host.

(ii) Virtual Disk- SAN-based storage is presented as storage targets to the physical host, which in turn, are then used to host the virtual machines' vdisks.

(iii) Virtual CPU and Memory - Physical CPUs and RAM can be dedicated or dynamically allocated to virtual machines. As there is no OS dependency to physical hardware, with CPU checking off, virtual machines can be seamlessly migrated to different hosts with the background changes to physical CPU and memory resources being transparent to the guest OSs running on the virtual machines.

(iv) Consolidated Management :- Performance and health of the virtual machines and guest OSs can be monitored and 'console' access to all of the servers can be accessed via a single console.

(v) Storage Virtual Motion :- The vdisks of active virtual machines can be seamlessly and transparently migrated across data stores while the execution state, active memory, and active network connections remain on the same physical host.

Ques 3.) Explain the following
 (i) Hardware Virtualisation
 (ii) OS Virtualization

*Type IV
Virtualization* → (i) Hardware virtualization - It is also known as Hypervisor-based Virtualization. This virtualization technology has a virtualization layer running immediately on the hardware, which divides the server machine into several virtual machines or partitions with a guest operating system running in each of the machine.

This virtualization approach provides binary transparency because the virtualisation environment products themselves provide transparency to the operating systems, applications, and middleware that operate above them.

(ii) OS Virtualization : - OS virtualization creates virtualisation environments within a single instance of an operating system. The virtual environments created by OS virtualization are often called containers.

Because all virtualisation environments must share resources of a single operating system

(A)

while having a private virtual operating system environment), a particular implementation of the technology may alter file system orientation and often introduce access restrictions to global system configuration or settings.

(4.) Explain virtual infrastructure requirements.
→

(5.) Explain the following related to virtualization in cases:-

→ (a.) Availability of machines:- This feature makes the machines in the virtualized datacenter as High Available. This would ensure that multiple datacenter activities are carried out even on the event of Hardware failures. This features should be configured and used for all the virtual machines in virtual environment as during hardware failure, the running virtual machines are started on another host machine and the downtime is reduced to minimal.

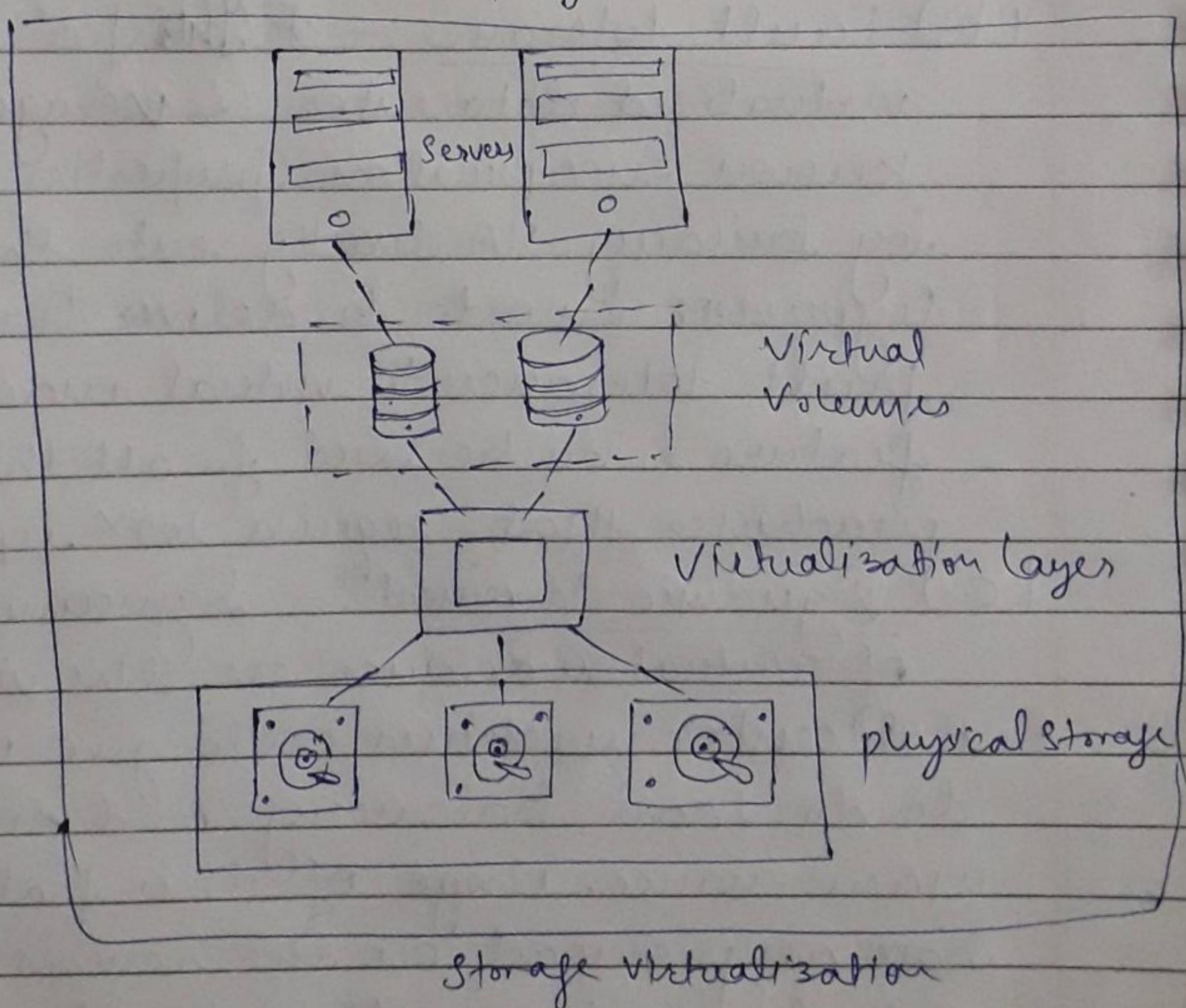
(b.) Fault tolerance:- ~~This~~ feature of the virtualized datacenter leverages the well-known encapsulation properties of virtualization by building HA directly into the bare-metal hypervisor in order to deliver hardware style fault tolerance to virtual machines. This feature is to be used for all the virtual machines that require 100% uptime.

(c.) Dynamic Movement:- Dynamic movement of virtual machines in the virtualized datacenter machines could give more options to do load balancing and hardware maintenance. Usage of this feature does not have any impact on the services offered by the virtual machine. This functionality is used by Distributed Resources Scheduling algorithm. Virtual dynamic motion enables the capability

of live migration of running virtual machines from one physical server to another with zero down time, continuous service availability, and complete transaction integrity.

- (6.) With neat block diagram explain storage virtualization and benefits.

→ Storage virtualization improves the utilization of storage and people access because it allows you to treat resources as a single pool, accessing and managing those resources across your organization more efficiently, by effect and need rather than physical location.



There are 2 servers with the virtual volumes. These virtual volumes may be mapped to different

applications. Between the actual storage and the virtual volume there is virtualization layer which helps in redirecting the I/O.

The physical storage or hard disks are combined or grouped together and then with the help of virtualization software this physical disks are divided into small blocks of data as per the requirements, which is presented to remote servers as a virtual disk. These virtual blocks of data look as the physical disk to the server. Then this disk can be used to extend the filesystem or to create a new one.

Benefits:-

- (i) It is highly scalable
- (ii) It allows easy addition and deletion of storage without affecting any application
- (iii) Easy data migration
- (iv) Easy storage management

(7.) Explain the following related SAN.

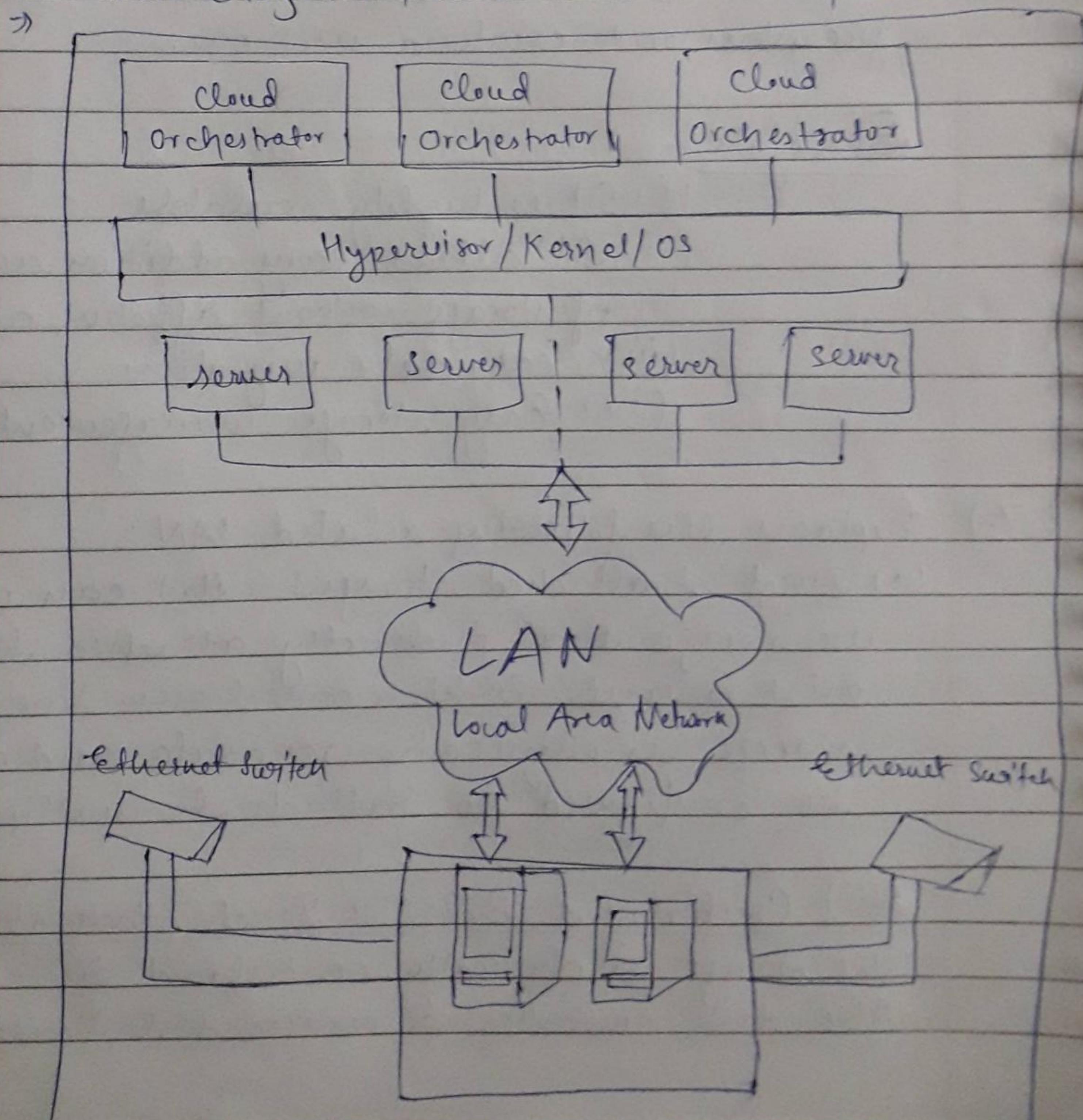
(i) Direct attached storage :- Host can only use storage that is directly attached through point-to-point SCSI connections. The disk storage is physically separate and cannot be configured to attach to multiple hosts.

(ii) Centralized But still Direct-attach storage :- The storage is physically centralized in one unit. The disk controller is connected to multiple

works with point-to-point connections. Re-assigning storage to different hosts requires re-cabling.

(iii) Shared Storage:- A SAN enables point-to-point connections between any host and disk controller. Disk volumes can be dynamically assigned to different hosts, without requiring re-cabling.
~~SAN's b~~

(8.) Explain network attached storage (NAS) with block diagram, its basics and protocols.



Network attached Storage (NAS) is dedicated file storage that enables multiple users and heterogeneous client devices to retrieve data from centralized disk capacity. Users on a local area network (LAN) access the shared storage via a standard Ethernet connection.

NAS device typically do not have a keyboard or display and are configured and managed with a browser-based utility. Each NAS resides on the LAN as an independent network node, defined by its own unique Internet Protocol (IP) address.

NAS protocols :-

- (i) Common Internet File System (CIFS) → protocols for windows environment
- (ii) Network File System (NFS) — helps in storing data at the file level
- (iii) iSCSI — gives the option to access the data at block level
- (iv) FCoE (Fibre channel over Ethernet) → combination of Fibre channel and Ethernet.

(g.) With neat block diagram explain cloud server virtualization.

Virtual machine technology enables customers to run multiple operating systems concurrently on a single physical server. This helps to cater various scenarios such as consolidation, automation test and development environments, migrating from x86 to non-x86 and workload management.

Block diagram — Page No - 152

(A)

- (10) Explain data and storage network convergence
- - The convergence of the data network and storage network into a single physical infrastructure will be attractive to businesses that want to lower costs and complexity in their datacenters without ~~off~~ forfeiting high availability and performance.
- Data and storage network convergence eliminates duplicate infrastructure, reducing the required hardware components - adapters, cables and switches - and resulting ~~the~~ in savings on hardware expenditures, power, cooling and space.
- This service include:-
- (i) Developing the network design
 - (ii) Selecting vendors and preparing a detailed design
 - (iii) Creating a roadmap for migration
 - (iv) Configuring, installing and testing the network.
 - (v) providing on-going maintenance support.

(1.) Give the definition of provisioning. Explain the benefits long-term and short-term goals of provisioning in cloud management.

⇒ Provisioning process is a service that uses a group of compliant processes called 'solution realization'. Provisioning design decouples provisioning build and integration.

Provisioning is the process of setting up IT infrastructure. It can also refer to the steps required to manage access to data and resources, and make them available to users and system.

Long-term Goals:-

- (i) Achieve operational efficiencies by using a common set of processes and procedures to deliver provisioning services to the enterprise.
- (ii) Achieve target environmental defect rate.
- (iii) Reduce time to set up development and test environments.
- (iv) Reduce hardware/ software spending through optimisation of all environments and reuse of assets.
- (v) Enforce enterprise provisioning standards.

Short-term :-

- (i) Reduce the defect rate for the set up of the development and test environments.
- (ii) Improve and provide consistency in the provisioning of environments for all platforms.
- (iii) Transfer skills and knowledge of new standard processes.

and procedures to provisioning teams.

(iv) Reduce work.

(v) Improve quality of work experience for process participants

(3.) List & explain the different factors that help to develop asset management strategy.

→ factors that help to develop asset management strategy are as follows:-

(i) Software Packaging

(ii) Incident Management

(iii) Pool Management

(iv) Release Management

(v) Configuration Management

(i) Software Packaging :- Asset management relies on software packaging. The output from software packaging will be used on a daily basis during the installation and configuration of the various software packages requested by the customer.

(ii) Incident Management (IM) :- It is used to track any interruptions or issues to the asset management service. These are most likely to IM will also be used as an entry point to problem Management.

(iii) Pool Management :- It works with asset management to make sure that the products requested are available on the required date and for the specified duration.

(iv) Release Management (ReM):- It controls the scheduling and testing of additions and updates to environments.

(v) Configuration Management:- It helps in the absence of a process with its own repository for assets and inventory items.

(3.) Define Resiliency and its capabilities:-

→ Resiliency is the capacity to rapidly adapt and respond to risks, as well as opportunities. This maintains continuous business operations that support growth and operate in potentially adverse conditions.

Resiliency capabilities:-

(i) From a facilities perspective, you may want to implement power protection

(ii) From a security perspective to protect your applications and data - you may want to implement a biometric solution.

(iii) From a process perspective; you may implement identification and documentation of your most critical business processes ; you may split functions of processes.

(iv) From an organisation perspective, you may want to implement a virtual workplace environment

(v) From a strategy and vision perspective , you would want to look at the kind of crisis management process you should have in place .

(4.) Explain cloud governance with a block diagram.
→



Compliance & Governance

Cloud governance refers to the structures, policies, and systems for the direction, control and activity monitoring of the company. It is the system that defines the roles and responsibilities of all the levels of management, considers the regulatory framework and risk management.

Cloud governance is the system directed towards controlling business activities by providing data security, data management and authorized access and modification of the data to avoid operational and financial loss. It also assists in risk management associated with cloud computing.

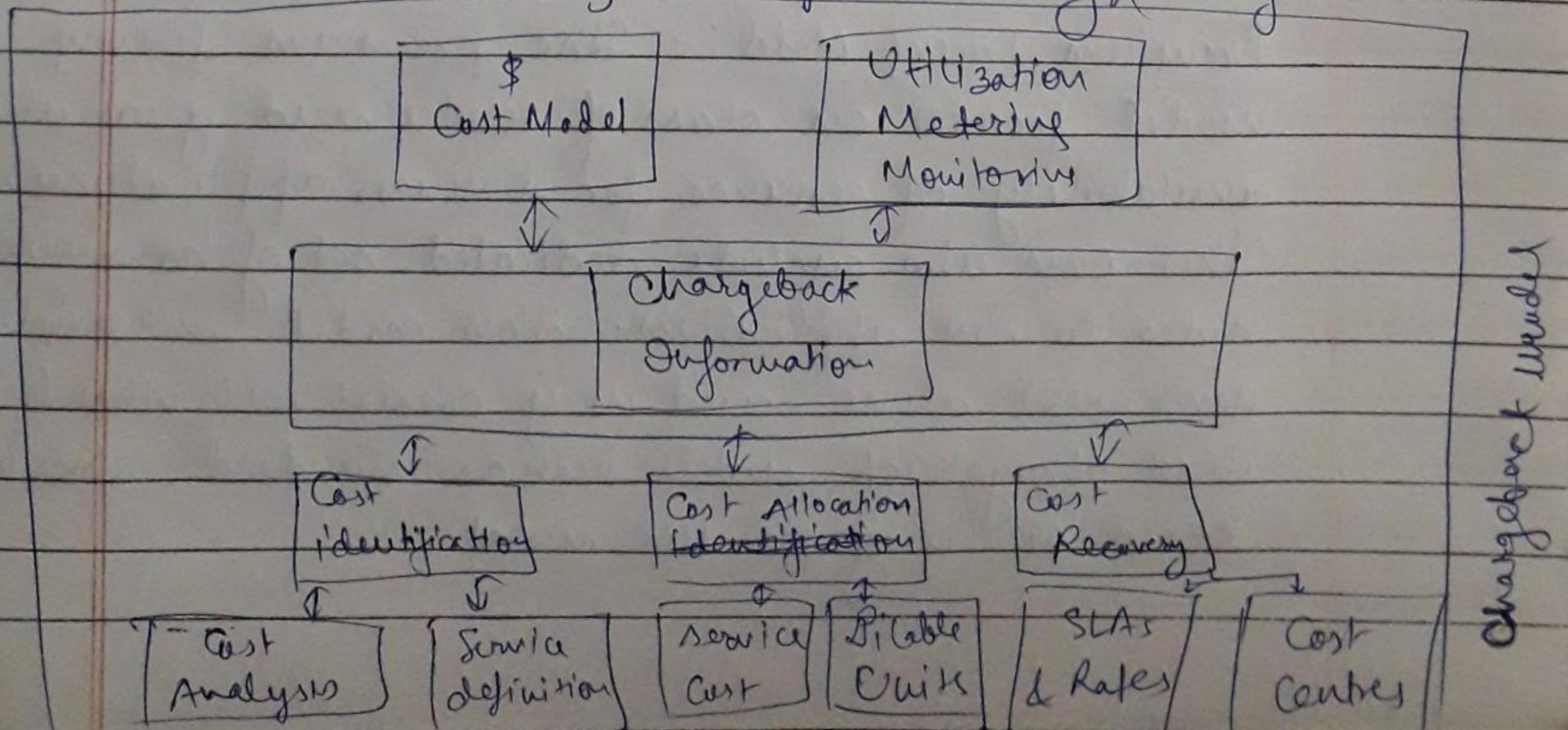
(5.)

Explain the following:

- (i) Mean Time Between Failure:- The mean (average) time between successive failures of a given component sub-system or system.
- (ii) Mean Time To Recover (MTTR) : - The mean (average) time that it takes to recover a component, sub-system or system.
- (iii) High Availability (HA):- The characteristic of a system that delivers an acceptable or agreed-upon high level of service to end-users during scheduled periods.
- (iv) Continuous Operations (Co):- The characteristic of a system that allows an 'end-user' to access the system at any time of the day on any day of the year ($24 \times 7 \times 365$)
- (v) Availability Management:- The process of managing IT resources (people and technology) to ensure committed levels of services are achieved to meet the agreed upon needs of the business.

(6.)

With a neat diagram explain any chargeback model.



Standard Subscription-Based Model - This is the simplest of all types of model. This model entails dividing the total operational costs of IT organization by the total number of applications hosted by the environment. This type of cost recovery is simple to calculate, and due to its appeal of simplicity, it finds its way in many organizations. While it is a simple chargeback model, it is fundamentally flawed, as it promotes subsidy and unequal allocation of resources.

Pay-Per-Use Model:- This model is targeted for environments with line of businesses (LOBs) of various sizes, and unlike the standard subscription model, this model emphasizes on charging based on application's consumption of resources and choice of service level agreements (SLAs). This model can be complicated in its approach, simply due to framework around resource usage and its monitoring.

Premium Pricing Model:- The premium pricing model focuses on class of service and guaranteed availability of resource for business application. This can also include dedicated set of hardware nodes to host applications. This model will usually never exist alone, and may coexist with other base line chargeback models such as standard subscription based or pay per use model.

Hybrid Model:- The 'Hybrid' model attempts to adopt best of breed models and offers to combined advantages of two or more chargeback models.

The hybrid model, combines the standard soft subscription model and pay per use model, and takes advantages of utility like billing service, much like utilities at home.