PHYSICS PRACTICAL SHEETS

Date: ..... CAMPUS
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Object of the Experiment (Block Letter)

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Group: .....
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unit-3

1. What is virtualization? List out its benefits.

Virtualization is a process by which one computer hosts the appearence of many computers. Virtualization is the ability to run multiple OS on a single physical system and share the underlying h/w resources. Virtualization is used to improve IT throughput and costs by using physical resources as a pool from which virtualization resources can be allocated.

Benefits :-

1. Slash your IT expenses :-
When you virtualize an environment that single physical server transforms into many virtual machines which have different OS and run different application which helps to reduce the cost of server and h/w.

2. Reduce downtime and enhance resiliency in disaster recovery :-
When a disaster affect a physical server, someone is responsible for replacing or fixing it which takes lots of time. With virtualized environment we can recovery with less time.

3. Increase efficiency and productivity
Less time dedicated to maintaining the environment increases, it will increase efficiency and productivity.

4. Protection from system failure :-
Virtualization lets us open ~~and~~ the same work on

another device. It store all our backup data through virtualization on cloud service and easy to access it any device.

5. Firewall and security:-
With virtual firewalls, access to your data is restricted at much lower cost as compared to traditional methods.

6. Smoother IT operations:
It helps IT professionals become efficient and agile to work.

Q. Explain the different types of virtualization.

1. Storage virtualization:
Storage virtualization is an array of servers that are managed by virtual storage system. The server aren't aware of exactly where their data is stored and instead function more like worker bees in a hive. It makes managing storage from multiple source to be managed and utilized as a single repository.

2. Network virtualization:-
Network virtualization refers to the management and monitoring of an entire computer n/w as a single administrative entity from a single s/w based administrator's console. The ability to run multiple virtual n/w with each has a seperate control and data plan. It co-exists together on top of one physical N/w. N/w virtualization provides logical switches, routers, firewalls, load balancer etc.

3. Desktop virtualization / OS

It a technology that lets users simulate a workstation load to access a desktop from a connected device remotely or locally. It allows the users os to be remotely stored on a server in the data center. It allows the user to access their desktop virtually, from any location by different machines

4. Application server virtualization:

Application server virtualization abstracts a collection of application servers that provides the same service as a single virtual application server. It is another larger presence in the virtualization space. It is often referred as 'advance load balancing' as it spreads application across server and server across application. This enables IT departments to balance the workload of specific s/w in an agile way.

5. Application virtualization:-

It is the application operate on computers as if they reside naturally on the hard drive, but instead are running on a server. The ability to use RAM and cpu to run the programs while storing them centrally on a server. It is a technique of placing an application on a central server and application can be run virtually on many platform. The virtualized program behaves precisely like native program installed on a real workstation for end users. It makes it easier for enterprises to centrally upgrade, manage and repair application. Admin may control and alter program access rights without signing into user's desktop.

6. Server Virtualization :-

Server virtualization divides a single server's resources into many virtual servers. These virtual servers can function as standalone devices. Server virtualization enables enterprises to run many independent OS with varying setting on a single (host). It causes an increase in the performance and reduces the OS cost by the deployment of main server resources into sub server resources.

7. Data Virtualization :-

Here data is collected from various sources and managed that at a single place without knowing more about the technical information like how data is collected, stored, formatted then arranged data logically so that its virtual view can be accessed by interested people and stakeholders and users through various cloud service remotely. It can be used to performing various task like data integration, Business integration, SOA data services etc.

3. Explain the different implementation levels of virtualization.

After virtualization, different user applications managed by their own OS can run on the same H/W, independent of host OS. Virtualization can be implemented at various operation levels. commonly virtualization layers include the instruction set architecture (ISA) level, H/W level, OS level, library support level and application level.

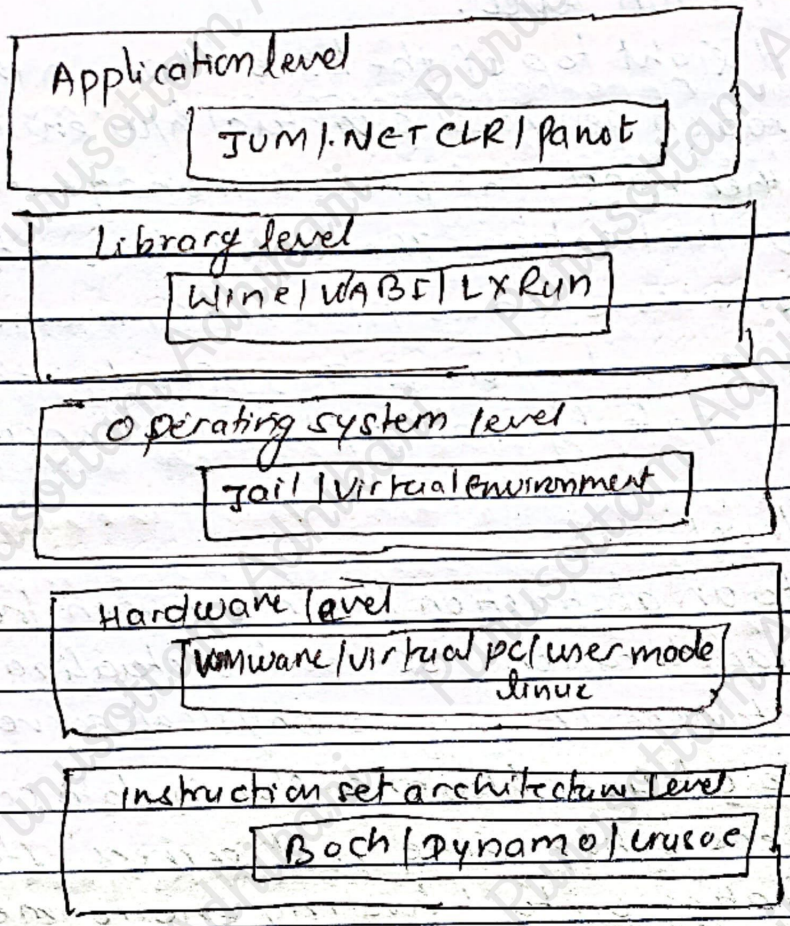


fig: five abstraction levels

A. Instruction set Architecture level

At ISA level, virtualization is performed by emulating a given ISA by ISA of host machine. For eg. MIPS binary code can run on an X86 based host machine with help of ISA emulation. With this approach, it is possible to run a large amount of legacy binary code written for various processor on any given new hardware host machine. Instruction set emulation leads to virtual ISAs created on any H/W machine. It is requires adding a processor-specific S/W translation layer to compiler. (V-ISA).

B. Hardware Abstraction level:
It is performed right top of the bare h/w. on the ~~other~~ one hand this approach generates a virtual h/w environment for VM. on other hand, the process manages the underlying h/w through virtualization. The idea is to virtualize a computer resources such as processors, memory and I/O devices. The intention is to upgrade the h/w utilization rate by multiple user concurrently.

c. Operation level
This refers to an abstraction layer between traditional OS and user application. OS-level virtualization creates isolated containers on a single physical server and OS instances to utilize h/w and s/w in data centers. The containers behave like real servers. It is commonly used in creating virtual hosting environments to allocate h/w resources among a large number of mutually distrusting users.

d. Library support level:
Most applications use APIs exported by user-level libraries rather than using lengthy system calls by OS. Since most systems provide well-documented APIs such as interface becomes another candidate for virtualization. Virtualization with library interfaces is possible by controlling the communication link between applications and rest of system through API hooks.
WINE has implemented this approach to support window applications on top of UNIX hosts.

e. User-level Application:-
Virtualization at the application level virtualizes an applicatio as a VM. on a traditional os, an application often runs as a process. Therefore application level virtualization is also refers as process-level virtualization. The most popular approach is to deploy high level language (HLL) VMs. In this scenario the virtualization layer sits as an application program on the top of os and layer exports an abstraction of VM can run program written and compiled to a particular abstract machine definition.
eg: .NET CLR and Java virtual machine.

4. Define server virtualization and discuss its types.
Server virtualization is the partitioning of a physical server into no of small virtual servers, each running its own os and applications. Server virtualization makes each virtual server seem and behaves like real server.
Benefits:-
i) Higher server ability ii) cheaper operating cost
iii) Eliminate server complexity iv) Increased application performan
v) Deploy workload quickly.

Types of server virtualization:
i) Paravirtualization:-
It is based on hypervisor. It is a virtualization technolog in which guest os is tweaked and recompile before installation inside VM to allow all guest os within system to share resources successfully. Due to modification in Guest os performance is enhanced as modified guest os communicates directly with hypervisor and emulation

overhead is removed
Advantages: easier, enhance performance, no emulation overhead
Limitation: Requires modification to guest os.

ii) Full virtualization:-
It can emulate the underlying h/w when necessary. The hypervisor traps the machine operations used by os to perform I/O or modify system status. The hypervisor abstracts all resources and allocates them to one or more logical entities known as VM.
Advantages:-
no modification to guest os
disadvantage:-
complex, slower due to emulation, installation of new device driver is difficult.

iii) Hardware-Assisted virtualization.
Same as full and paravirtualization in terms of operation except that it requires h/w support. This adds a layer of s/w to manage resources to logical VM instances through s/w hypervisor.
Advantages:
i) no modification to guest os
ii) very less hypervisor overhead
Limitation:-
H/W support required

iv) kernal level virtualization:-
Instead of using a hypervisor, it runs on a seperate version of Linux kernal and sees the associated virtual machine as a user space proces on physical host. It makes it easy to run multiple VM on a

single host

Advantages:-
- No special administrative s/w is required.
- very less overhead

Limitions:-
H/w support required.

vi) system level or os virtualization:-
Run multiple but logically distinct environment on a single instance of os kernal.

Advantages:-
i) significant lightweight than complete machine
ii) can host many more virtual servers
iii) enhanced security and isolation

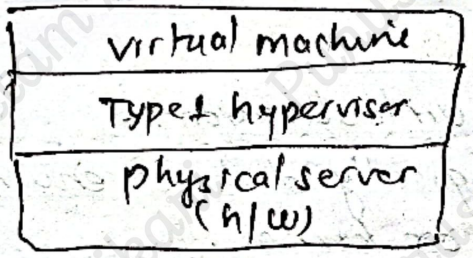
Limitation:-
kernal or driver problems can take down all virtual servers.

5. What is hypervisor mngt s/w. List the types of hypervisor.
A hypervisor, also known as a virtual machine monitor (VMM) is a computer hardware platform virtualization s/w that allows several os to share a single h/w host. Each os appears to have the host's processor, memory and resources to it. The hypervisor is controlling the host processor and resources, distributing what is needed to each os in turn and ensuring that guest os are

unable to disrupt each other.

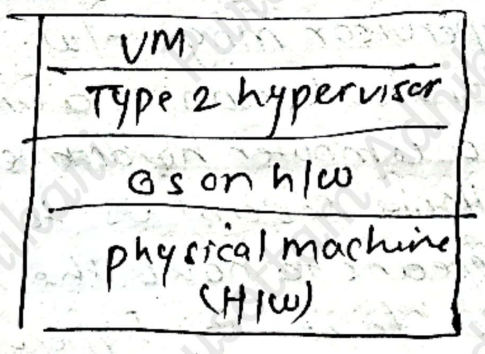
Types of hypervisors:
i) Type 1 hypervisor (native/bare metal hypervisor)
ii) Type 2 hypervisor (hosted hypervisor)

Type 1 Hypervisor



Type 1 hypervisor are those that operates directly on system h/w. They are frequently referred to as native 'baremeta', embedded hypervisor. on the top of this layer we can install many virtual machines. The machines are not connected in any way and can have different instances of OS and acts as different application servers. It is highly secure. eg:- oracle VM, Microsoft Hyper-V etc

Type 2 hypervisor:-



Type-2 hypervisor is installed on top of existing OS. It allows users to utilize their personal computer or server as a host for VM. This is less secure than type1 hypervisor. eg: VMware Workstation, Oracle VM VirtualBox etc.

6. What is load balancing? Write its benefits.

In computing, load balancing refers to the process of distributing a set of task over a set of resources with the aim of making their overall processing more efficient. Load balancing can optimize the response time and avoid unevenly overloading some compute nodes while other nodes are left idle. It refers to efficiently distributing incoming n/w traffic across a group of backend servers.

load balancer perform following functions:
- Distributes client request or n/w to load efficiently across multiple servers
- ensures high availability and reliability by sending requests only to servers that are online
- provides the flexibility to add or subtract servers as demand.

Benefits:- (i) Reduced downtime (ii) scalable
(iii) Redundancy (iv) flexibility
v) Efficiency

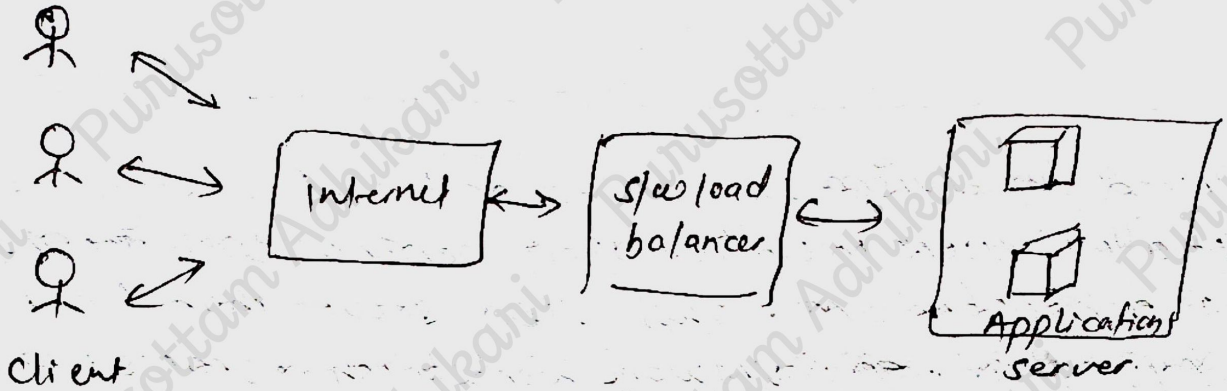


fig: load balancing.

7. What is virtual infrastructure? Write its requirement.

Virtual infrastructure is a collection of s/w-defined components that make up an enterprise IT environment. A virtual infrastructure provides same IT capabilities as physical resources but with s/w. IT team can allocate these virtual resources quickly and across multiple system based on varying needs of enterprise.

Virtualization product have strict requirements on backend infrastructure components including storage, backup, system mngt, security and time sync. Ensuring that these components are of required configuration is critical for successful implementation.

H/w requirement:- cpu: 4 or more core cpu
Memory: minimum 8 GB
N/w:- minimum one Nic plus one for mngt interface.

Storage:-

Local storage (SATA/SAS)

minimum 100 GB

For long term value we need :-

plan ahead:- When designing a VS ~~of~~, IT team should consider how business growth, market fluctation and advancement in technology might impact their H/W requirement, reliance on compute N/W and storage resources.

Look for ways to cut costs:-

cost cutting initiatives may range from replacing old servers and renegotiating vendor agreements to automating time consuming server mngt tasks.

prepare for failure:-

IT team should prepare for worst-case scenerios by taking advantage of monitoring tools, purchase extra H/W and relying on clusters to better manage host resource.

8. Differences between Full virtualization and para virtualization

Full virtualization	para virtualization
(i) virtual machine permits the execution of instruction with running of unmodified OS in an entirely isolated way.	(i) VM doesnot implement full isolation of OS rather provides different API which is utilized when OS is subjected to alternation.
(ii) less secure	(ii) more secure
(iii) uses binary translation and a direct approach as a technique for operations	(iii) uses hypercalls at compile time for operations
(iv) Slower than para virtualization in operation.	(iv) faster
v) more portable and compatible	v) less portable & compatible
vi) eg Microsoft and parallel system	vi) eg. VMware and Xen.

9. Differences between Type1 hypervisor and Type2 hypervisor.

Type1	Type2
(i) A hypervisor that run directly on host's h/w to control the h/w and to manage guest OS	(i) A hypervisor that run on a conventional OS just as other computer programs do
ii) called a native or Bare metal hypervisor	(ii) called a host OS Hypervisor
iii) Run directly on host h/w	(iii) Run on a OS similar to other computer program
(iv) eg: Microsoft Hyper-V oracle VM server	iv) eg VMware workstation oracle VM virtual box.

Type 1	Type 2
v) faster	v) slower
vi) high performance as there is no middle layer	vi) comparatively has reduced performance.
vii) Better scalability	vii) not so much because its reliance on underlying OS.
viii) H/W virtualization	viii) OS virtualization