Module – 2 (Virtualization and Storage Management)

1.What is virtualization and virtualization type?

Virtualization is a technique, which allows to share single physical instance of an application or resource among multiple organizations or tenants (customers). It does so by assigning a logical nameto a physical resource and providing a pointer to that physical resource when demanded.

Virtualization Concept Creating a virtual machine over existing operating system and hardware is referred as Hardware Virtualization. Virtual Machines provide an environment that is logically separated from the underlying hardware.

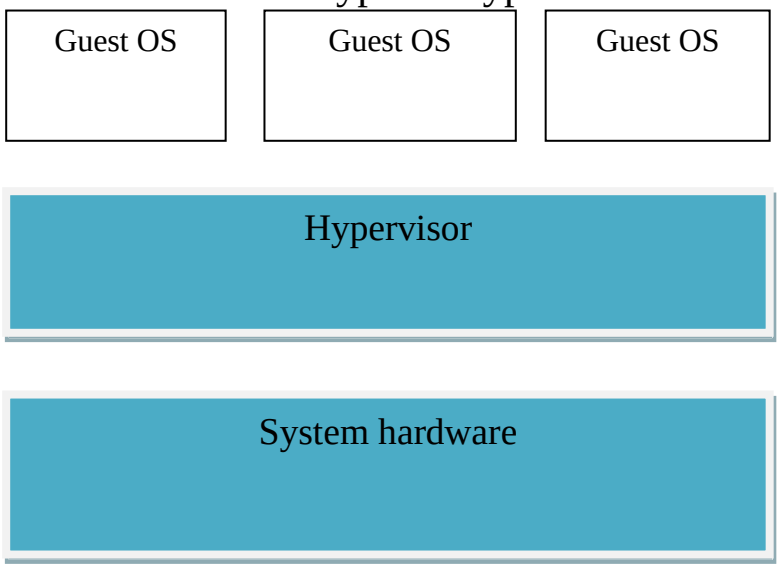
The machine on which the virtual machine is created is known as host machine and virtual machineis referred as a guest machine. This virtual machine is managed by a software or firmware, which is known as hypervisor.

HYPERVISOR Hypervisor is a firmware or low-level program that acts as a Virtual Machine Manager.

There are two types of hypervisor:

Type 1 hypervisor runs on bare system. LynxSecure, RTS Hypervisor, Oracle VM, Sun xVM Server, VirtualLogic VLX are examples of Type 1 hypervisor. The following diagram shows the Type 1 hypervisor.

Type 1: Hypervisor

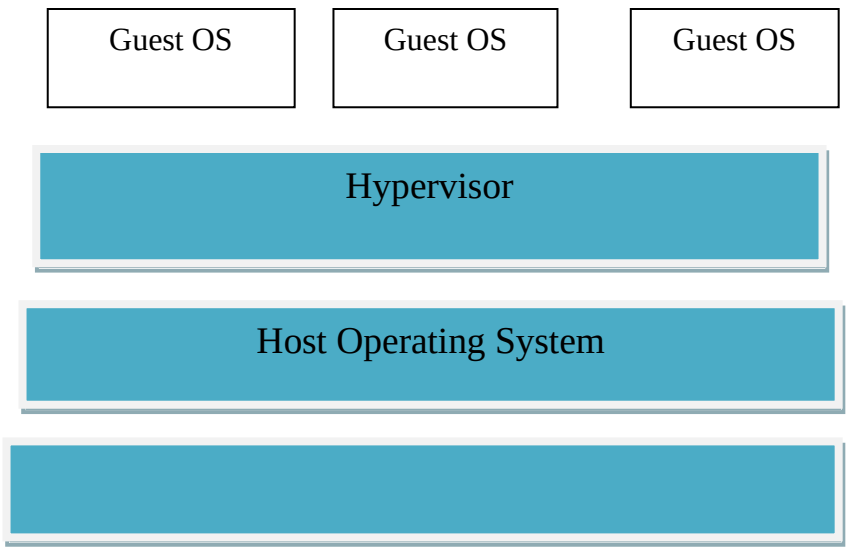


The type1 hypervisor does not have any host operating system because they are installed on a bare system.

Type 2 hypervisor is a software interface that emulates the devices with which a system normally interacts. Containers, KVM, Microsoft Hyper V, VMWare Fusion, Virtual Server 2005 R2, Windows Virtual PC and VMWare workstation 6.0 are examples of Type 2 hypervisor.

The following diagram shows the Type 2 hypervisor.

Type 2: Hypervisor



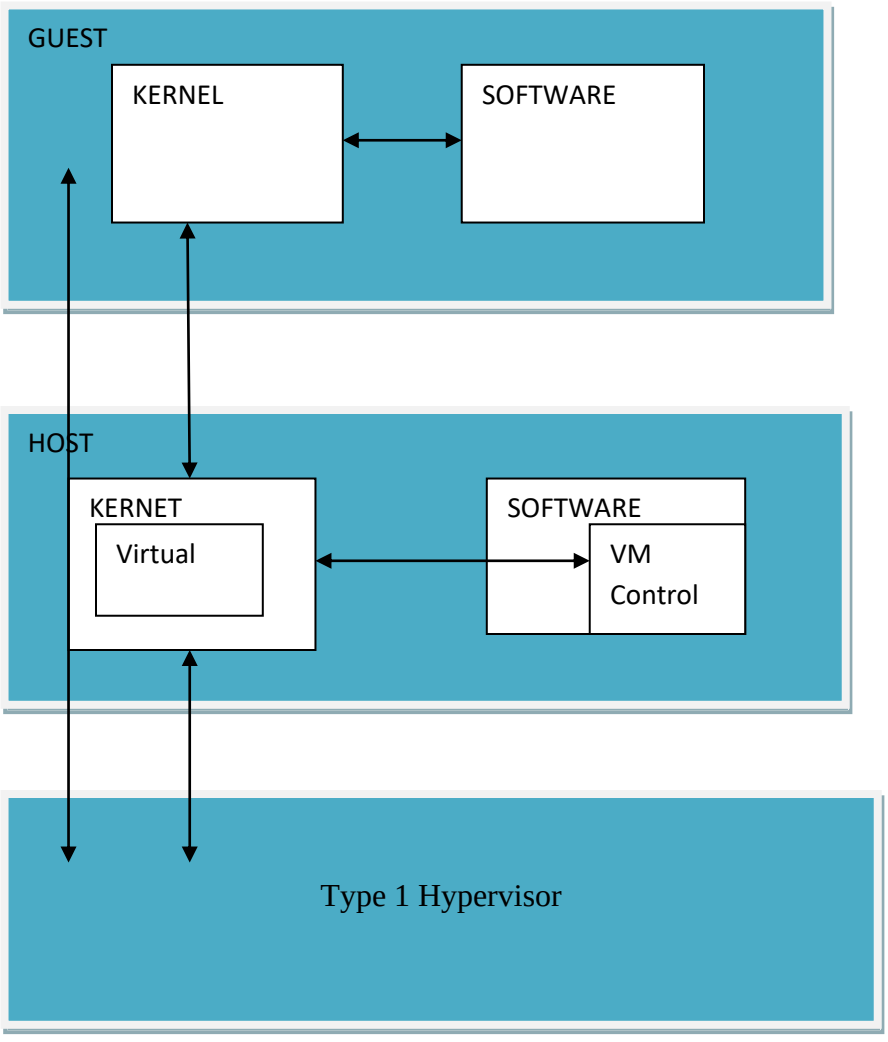
2.Type of hypervisor and how to manage it?

the three types of hardware virtualization:

1. Full Virtualization
2. Emulation Virtualization
3. Paravirtualization

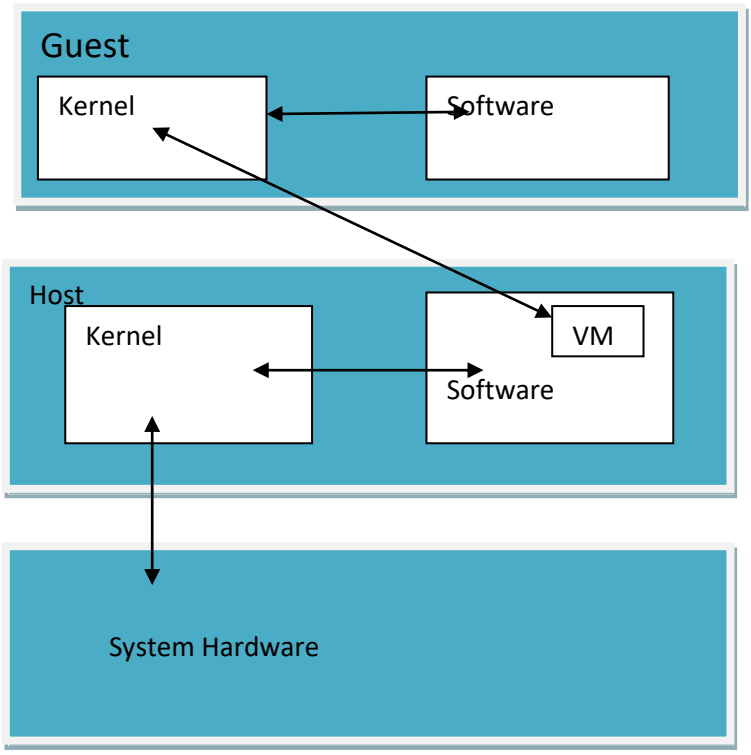
FULL VIRTUALIZATION

In Full Virtualization,
the underlying hardware is completely simulated. Guest software does not require any modification to run.



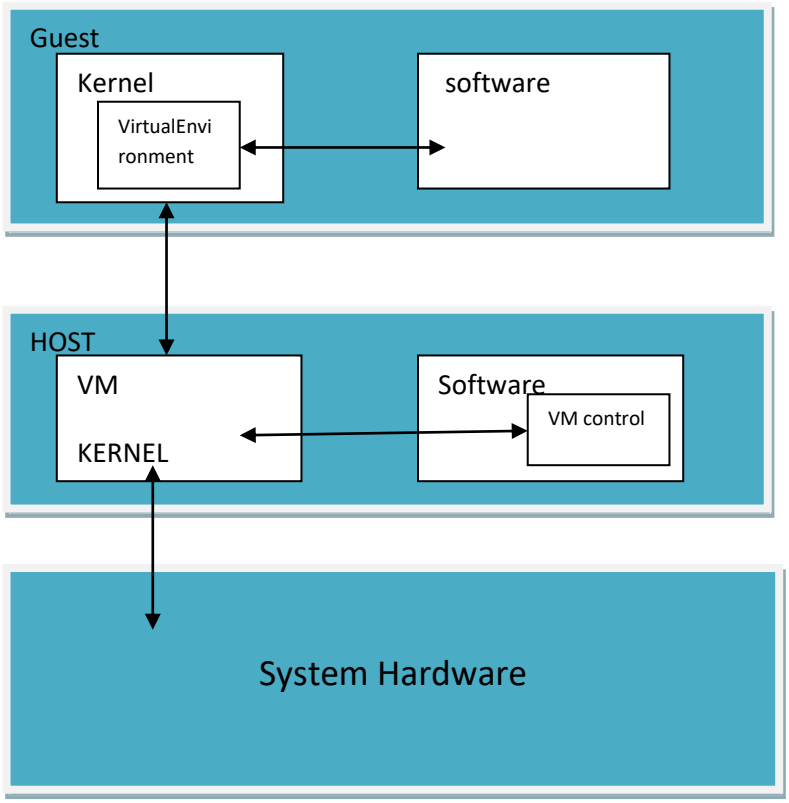
EMULATION VIRTUALIZATION

In Emulation, the virtual machine simulates the hardware and hence become independent of the it. In this, the guest operating system does not require modification.



PARAVIRTUALIZATION

In Paravirtualization, the hardware is not simulated. The guest software run their own isolated domains



3.What is snapshot and what is cloning?

A snapshot preserves the current state of a virtual machine, copying the VM's disk file. It is used for backup purposes. If you need to save the configuration of a virtual machine so you can revert back to it later if something goes awry, create a snapshot. A clone, by contrast, is an entirely separate copy of the VM. If you need to make a new VM that will run independently, cloning is the only way to go.

A VM clone is a copy of a virtual machine. The existing virtual machine is known as the parent, while the new VM is called the clone. After the cloning operation, the clone VM runs as a separate virtual machine.

Why would you need to clone a virtual machine? Cloning is a fast and simple way to create a new virtual machine that shares properties with an existing one. The process of installing a guest operating system and

programs from scratch can take a great deal of time. Using cloning, you can perform installation and configuration once, and then use the clone as a basis for many future virtual machines.

VM cloning is most useful for deploying multiple identical virtual machines to a group of users. For example, a sysadmin can clone a virtual machine for each employee in a particular department—since the employees use the same applications, their setups should be the same. Similarly, a teacher may wish to clone a virtual machine for each student, with lesson materials and programs preinstalled. VM cloning is also helpful for software testing. Testers can clone a development environment and use it as a baseline for comparison while testing.

There are two types of VM clones: full clones and linked clones. A full clone is a completely separate copy of a VM that shares no system resources with the parent once it's running. A linked clone, on the other hand, continues to share virtual disks with the parent after it's created. Since it runs independently, a full clone generally has faster performance than a linked one. However, a full clone can take longer to create, with delay times of up to a few minutes when file sizes are large. Linked clones are faster to create and have the advantages of saving disk space by allowing multiple VMs to run off a single software installation.

4.Roles of virtualization in cloud computing?

Virtualization and cloud computing often seems interchangeable. Although these technologies are similar, they are not the same, and understanding the difference between the two is important for your business decisions.

Simply put, virtualization is a technology that transforms physical hardware into virtual resources, while the cloud is an environment that provides those virtualized resources via the Internet. Cloud computing uses virtualization technology to provide services that allow end-users to access virtualized servers, applications, etc., without having to purchase that hardware.

Virtualization is a key element of the cloud computing concept because it is the only way to build a truly efficient cloud that offers an affordable cost of ownership, efficient resource management, and a service level guarantee.

5.What is container?

Containers are packages of software that contain all of the necessary elements to run in any environment. In this way, containers virtualize the operating system and run anywhere, from a private data center to the public cloud or even on a developer's personal laptop. From Gmail to YouTube to Search, everything at Google runs in containers. Containerization allows our development teams to move fast, deploy software efficiently, and operate at an unprecedented scale. We've learned a lot about running containerized workloads and we've shared this knowledge with the community along the way: from the early days of contributing cgroups to the Linux kernel, to taking designs from our internal tools and open sourcing them as the Kubernetes project.

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6.What is high availability and live migration in virtualization?

With the coming changes in Windows Server 2012 (WS2012), I thought I'd take a few minutes to explain the difference between HA and Live Migration.

High Availability (HA)

HA is when we make a virtual machine highly available by placing it on a cluster of hosts, e.g. a group of Hyper-V hosts in a Windows Server Failover Cluster, or a group of ESXi hosts in a vSphere cluster. If a host has a failure VM can be failed over to a different host. This means that

an automated system provides better levels of availability than you get with non-clustered hosts. Typically, the failed host has crashed or powered down, and the VM is booted up on a different host.

Live Migration (aka VMotion)

Live Migration is a system where a running virtual machine can be moved from host A to host B with zero downtime. It is different from HA because it is more proactive than a failover operation. For example, Live Migration will be used by an administrator to move a VM from one host, that is going to have some maintenance operation, to another host with spare capacity.

7.Storage configuration –describe block storage, file storage and object storage---DAS NAS and SAN

Deciding on the right storage system can be a complex decision, as it needs to balance costs, storage capacity needs, and scalability requirements. The three primary options for enterprise data storage systems are direct-attached storage (DAS), network-attached storage (NAS), and storage area networks (SANs). Each offers advantages and disadvantages for organizations.

The major differences between DAS, NAS, and SAN are costs, scalability, and how storage is shared. The three systems also use different storage mechanisms: DAS primarily uses hard-drive storage with sectors, NAS uses shared files, and SAN uses block storage. Different technologies are also used for transmitting data. DAS uses IDE/SCSI, NAS uses TCP/IP and Ethernet, and SAN uses Fibre Channel and IP.

8.Describe storage allocation and provisioning

Storage provisioning is the process of assigning storage capacity to servers, computers, virtual machines or any other computing device. A broad term, storage provisioning incorporates manual and automated mechanisms used to allocate server storage space within a networked computing environment

Storage provisioning is implemented in a computing environment where the core storage resides in a storage area network (SAN) server. Storage may be provisioned to all connected devices - either manually, by the storage administrator, or automatically on runtime and on demand through a SAN software appliance.

The storage provisioning process requires careful planning on the front end. This helps the administrator or SAN software predict future storage requirements and optimize the underlying network for faster and more reliable data storage and retrieval.

Storage provisioning may be classified as fat provisioning or thin provisioning.