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Seat no: 19I60041
Program: IT
Scheme and Sem:
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Sub: CCS
Sign: Madhav

(Q2) B) i] Xen is an open source hypervisor program developed in Cambridge university

2] Xen is a microkernel hypervisor which separates the policy ~~from~~ from the mechanism

3] The Xen hypervisor implements all the mechanisms leaving the policy to be handled by Domain 0, does not include any device drivers natively.

4] It just provides a mechanism by which guest OS can have direct access to the physical devices. As a result, the size of the Xen hypervisor is kept rather small

5] Xen is a type I hypervisor providing services that allow multiple computer operating systems to execute on the same computer hardware concurrently.

6] The basic components of a Xen-based virtualization environment are: Xen hypervisor, the Domain 0, any number of other VM Guests, and the tools, commands and configuration files that lets us manage virtualization.

The Xen hypervisor:

The xen hypervisor is an open-source software prog. that coordinates the low level interaction between the virtual machines and physical hardware

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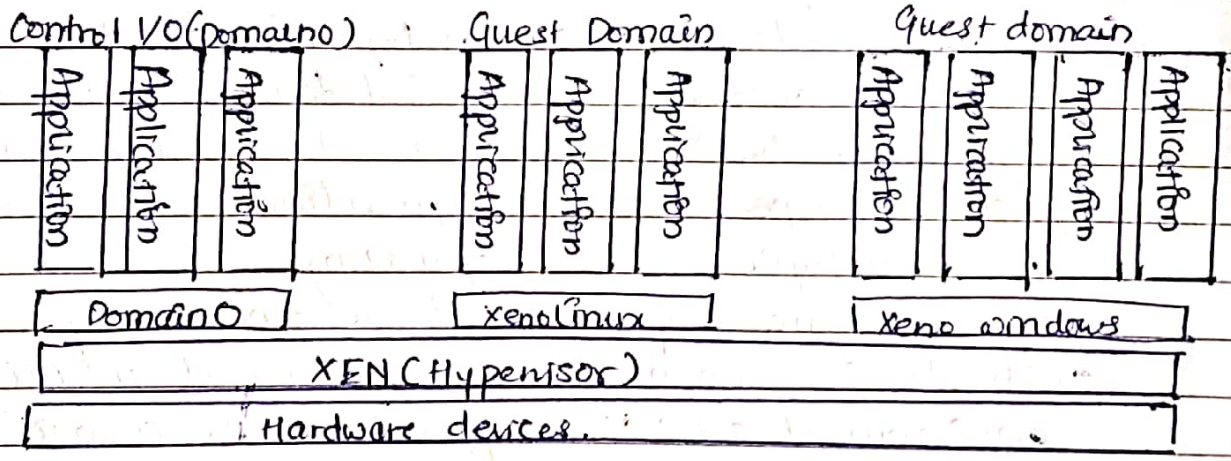
The Domain 0.

The virtual machine host environment, also reffered to as Domain 0 or controlling domain and is comprised of several components, such as:

- The SUSE Linux OS, which gives the administrator a graphical and the command line environment to manage the virtual machine host components and its virtual machines.

Domain 0 is only responsible for the access to drivers, and if any co-ordination has to be done, it will be handled by Domain 0.



7) The core components of xen system are hypervisor kernel and applications.

8) Like other virtualization systems many guest OS can run on top of the hypervisor.

9) The guest OS, which has control ability is Domain 0 and the others are called Domain U. Domain 0 is the priviledged guest of xen.

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10] It is first loaded when Xen boots without any file system drivers being available. Domain 0 is designed to to access hardware directly and manage devices

11] Therefore one of the responsibilities of domain 0 is to allocate and map hardware resources for the guest domains (the Domain U domains)

12] For ex: Xen is based on Linux and its security level is C2 its management vm is named Domain 0, which has the privilege to manage other VMs implemented on the same host

13] If Domain 0 is compromised the hacker can control the entire system. So in the VM systems security policies are needed to improve the security of Domain 0.

14) Domain 0 behaving as a VMM allows users to create copy, save, read, modify, share, migrate and roll back VMs easily as manipulating a file, which flexibly provides tremendous benefits of users.

15) It also brings a series of security problems.

16] Traditionally, machines lifetime can be envisioned as a straight line where the current state of the machine is a point that progresses as the software executes

17) During this time the config changes are made, software is installed and patches are applied.

18) In such environment VM state is into a tree: At any point execution can go into N diff branches where multiple instances of VM can exist at any point in this given time.

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19] VMs are allowed to roll back to previous states in their execution (e.g. to fix config errors) or re-run from same point many times (e.g. as means of distributing dynamic content or circulating a live system image.

20) Advantages is that being able to run an OS that was developed for another architecture on our own architecture.

21) Disadvantage: Virtualizing a complete CPU comes with heavy performance price.

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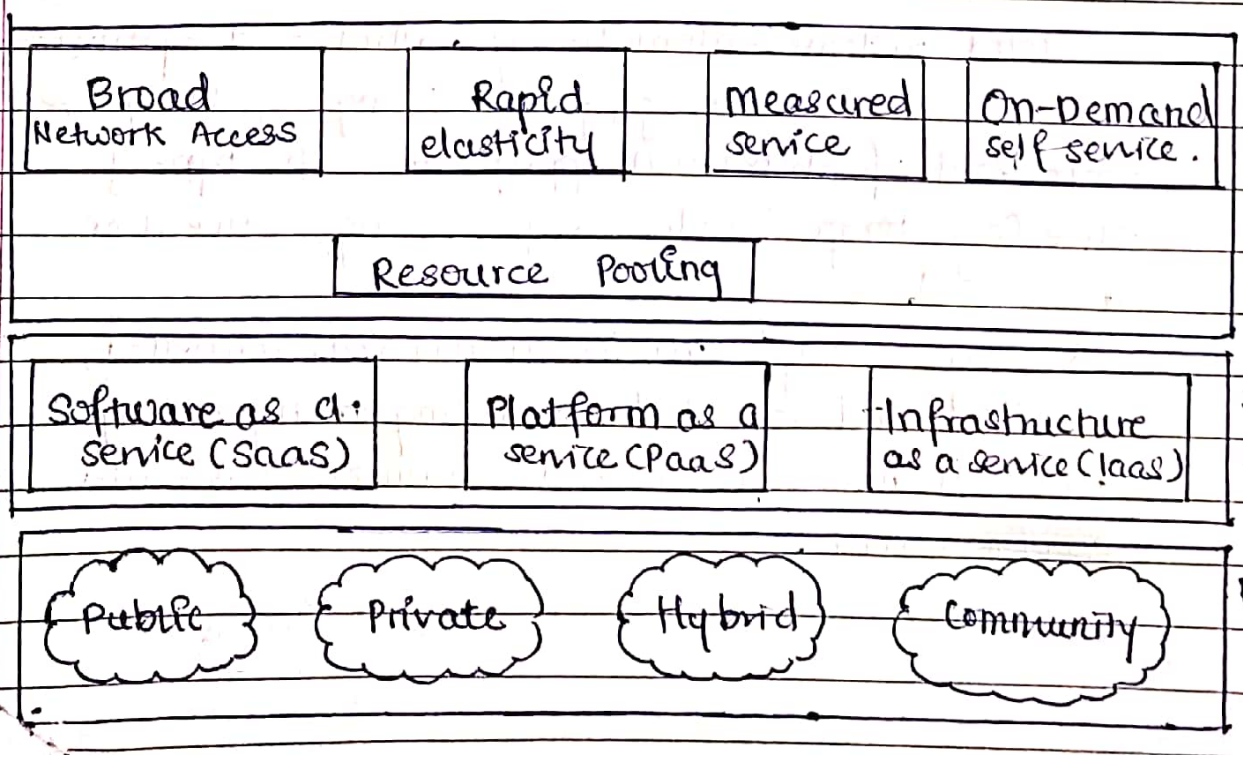
(Q2) A) 1] NIST stands for national Institute of Standard & technology

2] NIST is the part of US government department of commerce and works to provide and promote the economy and public welfare by providing technical leadership for measurement and standards infrastructure.

3] NIST defined cloud computing as, Cloud computing is a model for enabling ubiquitous, convinient, on demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with mimal management effor or serice provider interaction.

4] The NIST definition lists that ~~this~~ this cloud model is composed of five essential characteristics, three serice models, and four deployment models.



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Essential Characteristics:

i) Broad network access:

Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogenous thick or thin client platforms. e.g. mobile phones, laptops, tablets etc

ii) Rapid elasticity:

The capabilities can be elastically provisioned and released, in some cases automatically to scale rapidly outward and inward in proportion with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quality at any time.

iii) Measured Service:

Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of serice (e.g storage, bandwidth, processing, active user accounts).

Resource usage can be monitored, controlled, audited and reported, providing transparency for both the provider and consumer of the utilized ~~service~~ serice.

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iv) On-demand self service :

A consumer can unilaterally provision computing capabilities, such as server time and network storage as needed automatically without requiring human interaction with each service provider.

v) Resource pooling :

The providers computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to the consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction eg country or state.
Examples of resource includes storage, memory, processing & network bandwidth

Service models :

1) Software as a Service (SaaS) :

i) The capability provided to the consumer is to use the providers application running on a cloud infrastructure

ii) The applications are accessible from various client devices through either a thin client surface (web browser) eg web based email or a program interface.

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iii) Here, the consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems or even individual application capabilities, with the possible exception of limited user specific application configuration settings.
iv) In this, the cloud provider hosts the application and makes them available to end users over the Internet.

2) Platform as a service (PaaS)
i) The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries etc supported by the provider.
ii) The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating system or storage, but has control over the deployed applications and possibly configuration settings for the application hosting environment.

3) Infrastructure as a Service (IaaS)
i) The capability provided to the consumer is to provision processing storage, networks and other fundamental computing resources where the consumer is able to deploy and run arbitrary software.
ii) The consumer has control over operating systems, storage and deployed applications and possibly limited control of select networking components.

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Deployment Models:

1) Private cloud:

The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g. business units). It may be owned, managed and operated by the organization, a third party or some combination of them and it may exist on or off premises.

2) Public cloud:

This cloud is open to use for the general public. It may be owned, managed and operated by a one, business or govt organization or some combination of them. It exist on the premises of cloud provider.

3) Hybrid cloud:

This is composition of two or more distinct cloud infrastructures (private, public or community) that remain unique but are bound together that enables data and application portability (e.g. cloud bursting for load balancing between clouds.

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4] Community cloud:

This is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (eg mission, security requirements etc). It may be owned, managed and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.