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Internal Assessment Test 1 – May 2022

Sub:	Cloud Computing & Its Applications				Sub Code:	18CS643	Branch:	CSE
Date:	10-05-2022	Duration:	90 mins	Max Marks:	50	Sem / Sec:	VI/ A&B&C	OBE

Answer any FIVE FULL Questions

MARKS CO RBT

1 (a) Briefly summarize the IaaS Reference Model with the help of a neat diagram.

[07] 1 L2

SOLUTION:

Infrastructure and Hardware-as-a-Service (IaaS/HaaS) solutions are the most popular and developed market segment of cloud computing. They deliver customizable infrastructure on Cloud Computing Architecture Dept of CSE Page 3 demand. The available options within the IaaS offering umbrella range from single servers to entire infrastructures, including network devices, load balancers, and database and Web servers. The main technology used to deliver and implement these solutions is hardware virtualization: one or more virtual machines opportunely configured and interconnected define the distributed system on top of which applications are installed and deployed. IaaS/HaaS solutions bring all the benefits of hardware virtualization: workload partitioning, application isolation, sandboxing, and hard-ware tuning. From the perspective of the service provider, IaaS/HaaS allows better exploiting the IT infrastructure and provides a more secure environment where executing third party applications. From the perspective of the customer it reduces the administration and maintenance cost as well as the capital costs allocated to purchase hardware.

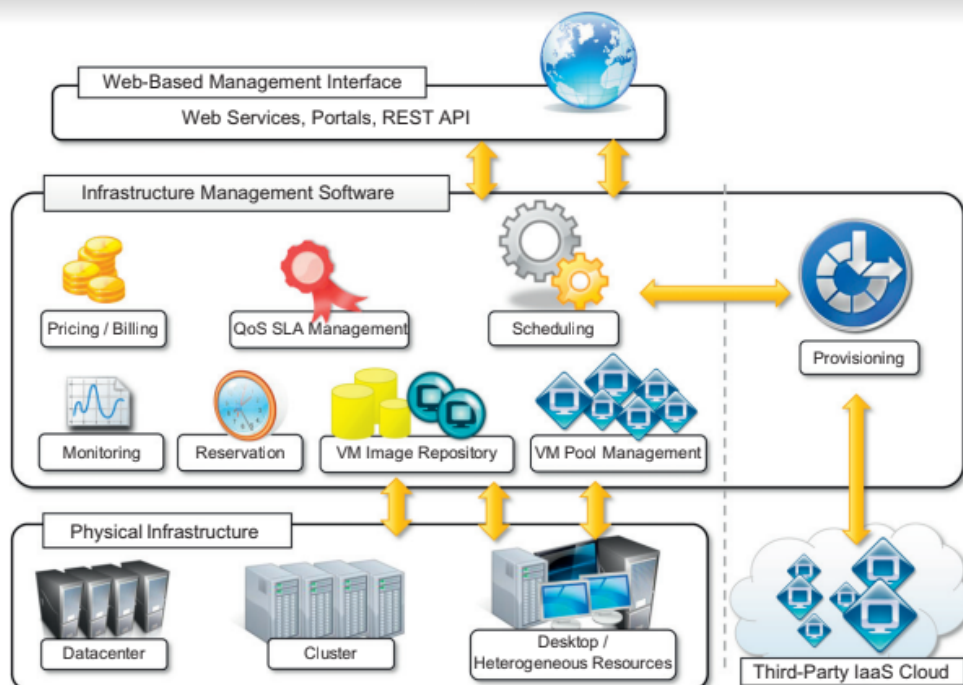
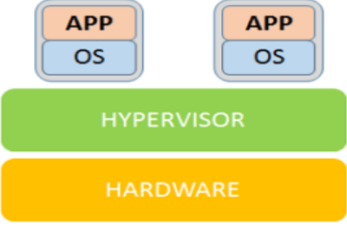


FIGURE 4.2
Infrastructure-as-a-Service reference implementation.

(b)	<p>Consider an organization with growing and fluctuating demands and security is not a primary concern. Suggest a suitable deployment model for this organization with supporting reasons.</p> <p>SOLUTION:</p> <p>Public Cloud Deployment is suitable for this scenario. Public cloud is feasible because, the resources can be changed dynamically based on the user's request</p>	[03]	2	L3
2 (a)	 <p>From the above diagram, explain the role of the Hypervisor. Briefly discuss what changes will it make to the system if the Hypervisor is removed.</p> <p>SOLUTION:</p> <p>A hypervisor is a form of virtualization software used in Cloud hosting to divide and allocate the resources on various pieces of hardware.</p> <p>A hypervisor is a process or a function to help admins isolate operating system and applications from the underlying hardware. Cloud computing uses it the most as it allows multiple guest operating systems (also known as virtual machines or VMs) to run simultaneously on a single host system.</p> <p>If the Hypervisor is removed from the above mentioned architecture, then it become a traditional architecture in which a user cannot virtualize the resources and all the resources can be used by the underlying OS and applications.</p>	[05]	1	L3
(b)	<p>Describe the Pros & Cons of virtualization in the context of cloud computing.</p> <p>SOLUTION</p> <p>Pros:</p> <ol style="list-style-type: none"> 1. Managed execution and Isolation: Allows building secure and controllable computing environments. 2. it can be configured as a sandbox, preventing harmful operations to cross the virtual host. 3. Portability: Virtual Machines are easily portable from one machine to another. 4. Portability and self containment reduces maintenance cost, makes efficient use of resources, reduces energy consumption and have less impact on environment. <p>Cons:</p> <ul style="list-style-type: none"> ● Performance Degradation: Because of the abstraction layer between the guest and the host, increased latencies and delays can be experienced. <ul style="list-style-type: none"> ○ Maintaining the status of the virtual processor. ○ Supporting the privileged instructions. ○ Supporting paging within VM. ○ VM and application share the same resources 	[05]	1	L2

	<ul style="list-style-type: none"> ● Inefficiency and Degraded user Experience: Leads to inefficient use of the host. Need to include the libraries to support. <p>Security Threats: Malicious programs can preload themselves before OS and act as VM, which controls OS. (BluePill, SubVirt).</p>			
3 (a)	<p>Write a note on the challenges of cloud computing</p> <p>SOLUTION:</p> <p>Cloud Interoperability and Standards: The presence of standards avoids the vendor lock-in situation. CCIF (Cloud Computing Interoperability Forum), the Open Cloud Consortium. The standardization is mostly concerned with the lower level of Cloud computing architecture. Open Virtualization Format (OVF) is an attempt to provide a common format for VMs. Lack of Standard set of APIs, made the cloud solution, vendor specific.</p> <p>Cloud Definition: Several attempts made in defining cloud computing and in providing the classification of services. NIST defines as ondemand access, classifies services as IaaS, PaaS, SaaS and categorizes deployment models as public, private, hybrid and community. University of California,Santa Barbara (UCSB) defined the ontology of cloud computing as five layers. Application, Software environment, s/w infrastructure, Kernel and hardware. Blue Mountain Labs , David Linthicum, gives detailed classification in to 10 classes along with the vision.</p> <p>Scalability and Fault Tolerance: Cloud allows the scaling of the infrastructure or application services. To implement that the middleware has to be designed with the principle of scalability. It is challenging to provide a highly scalable and fault tolerant system for a competitive performance.</p> <p>Security, Trust and Privacy: Security, Trust and Privacy are the major obstacles for massive adoption of Cloud Computing. Provides security via encryption techniques, at the same time exposes the VMs to new threats. Most prone to insider attacks and lack of control over the cloud environment.</p> <p>Organizational Aspects: Acceptance of Cloud computing will require a significant change to business processes and organizational boundaries. What is the role of new IT department with in the enterprise? How will the compliance department perform its activities on the data? What are the implications of organizations that lose control over some aspects of the services?</p>	[06]	1	L1
(b)	<p>For a SaaS application, who will be responsible to provide security for the infrastructure? Will it be a cloud service provider or a cloud service consumer? Formulate your views about it.</p> <p>SOLUTION:</p> <p>Software as a service (or SaaS) is a way of delivering applications over the Internet—as a service. Instead of installing and maintaining software, you simply</p>	[04]	1	L3

access it via the Internet, freeing yourself from complex software and hardware management.

SaaS applications are sometimes called Web-based software, on-demand software, or hosted software. Whatever the name, SaaS applications run on a SaaS provider's servers. The provider manages access to the application, including security, availability, and performance.

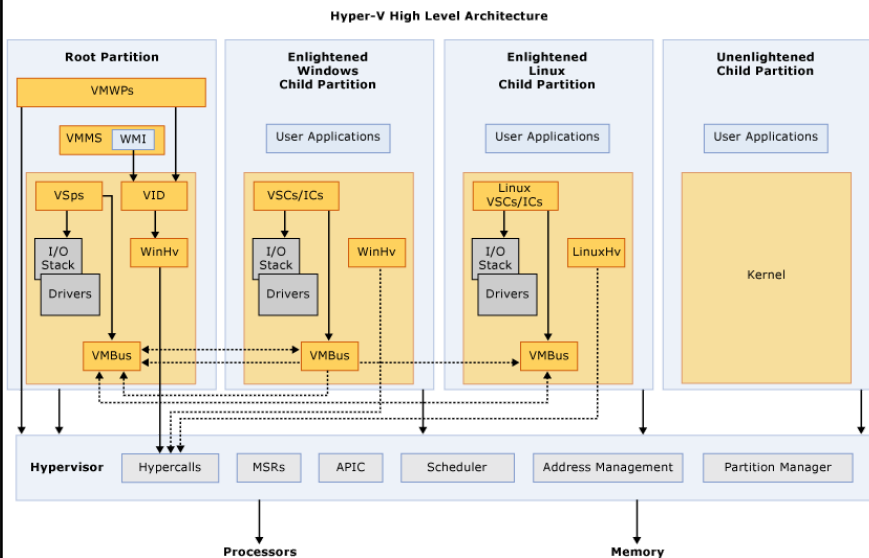
4 (a) Explain Microsoft Hyper-V architecture.

[08]

2

L2

SOLUTION:



Hyper-v supports multiple and concurrent execution of the guest OS by means of partitions. A partition is a completely isolated environment in which an OS is installed and run. Hyper-v takes control of the hardware and host OS and becomes parent partition. Parent partition is also called as root partition. Only the parent partition has the access to the hardware and runs virtualization stack. Creates child partitions with the help of the hypervisor. Child partitions are used to host the guest OS and do not have access to the underlying hardware. The interaction is managed by parent partition or the hypervisor. Hypervisor runs in Ring 1.

The parent executes the host OS and implements the virtualization stack. This partition always host the instance of Windows Server 2008 R2. This partition directly communicates with underlying hardware. Manages creation, execution, management and destruction of the children partitions. It does the same with VID (Virtualization Infrastructure Driver). For every child partition a Virtual Machine Worker Process (VMWP) is instantiated in the parent partition, that manages the child partition by interacting with the hypervisor.

Child partitions are used to execute guest OS. These are isolated environments, allows secured and controlled execution of guests. There are two types of children:

- Enlightened Partition: Guest Supported by Hyper-V
- Unenlightened Partition: Not Supported by Hyper-V

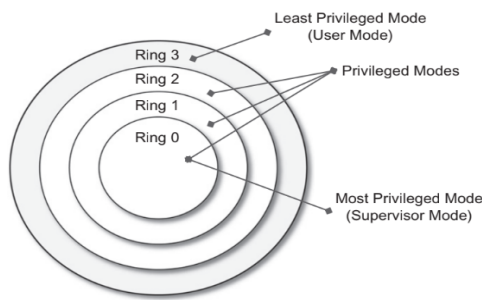
(b) Hypervisor is usually in Ring 0 Privilege level. Explain why it cannot work in Ring 2 or Ring 3.

[02]

2

L2

SOLUTION:



All the current systems support at least two different execution modes:

Supervisor Mode : Executes all instructions without any restriction. Also known as Master mode or Kernel Mode.

User Mode: Restrictions to control Machine Level instructions. The Hypervisor runs above the supervisor.

Ring 0 has privileged instructions that communicate with the underlying hardware. if the hypervisor is installed in Ring 2 or 3 it cannot translate the user instructions coming from the applications to the Ring 0 instructions. Thus, it wont act like a hypervisor, instead it will be like a normal application.

5 (a) Classify the various types of clouds. Explain Hybrid cloud & list out the benefits.

[3+3]

1

L2

SOLUTION:

Different types of cloud computing deployment models are:

1. Public Cloud
2. Private Cloud
3. Hybrid Cloud
4. Community Cloud

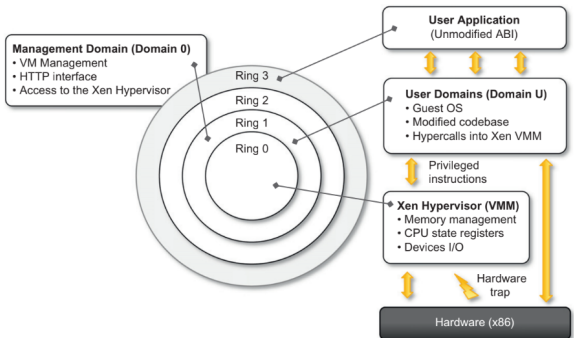
The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open for everyone.

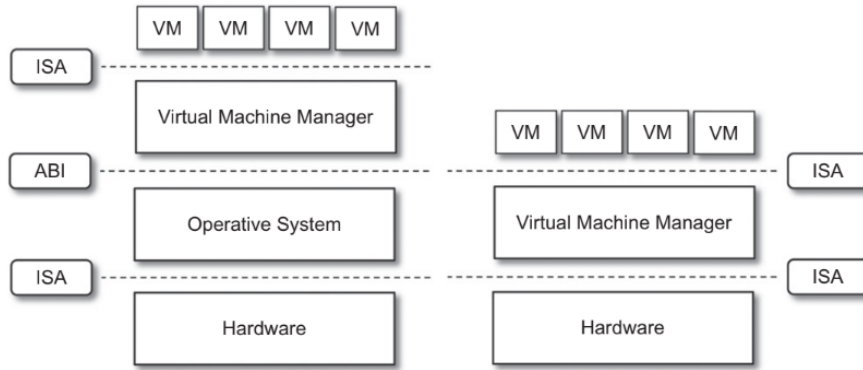
The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer).

Community Cloud allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business.

Hybrid Cloud the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.

Advantages of the hybrid cloud model:

	<ol style="list-style-type: none"> 1. Flexibility and control: Businesses with more flexibility can design personalized solutions that meet their particular needs. 2. Cost: Because public clouds provide for scalability, you'll only be responsible for paying for the extra capacity if you require it. 3. Security: Because data is properly separated, the chances of data theft by attackers are considerably reduced. 			
(b)	<p>List the benefits of cloud computing.</p> <p>SOLUTION: The benefits of cloud computing are as follows:</p> <ol style="list-style-type: none"> 1. On-demand access 2. Fair Pricing 3. Scalability 4. Efficient resource allocation 5. 24 x 7 Availability 6. Automated updates on software 7. Security 8. Reliability 9. Pay-as-you-use model 	[4]	1	L1
6 (a)	<p>Explain in detail how Virtualization is achieved in Xen.</p> <p>SOLUTION: Xen is an open source initiative for implementing virtualization based on Paravirtualization. Initially developed by a group of researchers in University of Cambridge. Used for Desktop or Server Virtualization. Provides Cloud computing solutions by the means of Xen Cloud Platform (XCP). Xen based system is managed by Xen Hypervisor that runs in highest privileged mode. Controls the access of guest OS to underlying Hardware. Paravirtualization needs the OS codebase to be modified. Hence not all OS can be used as guests in Xen-based environment. Supports virtualization for Linux based OS and do not support Windows based OS.</p>  <p>FIGURE 3.11 Xen architecture and guest OS management.</p>	[06]	2	L2
(b)	<p>Differentiate Type I and Type II Hypervisor with a suitable diagram.</p> <p>SOLUTION:</p>	[04]	1	L2



Type 1 Hypervisor is called a Bare Metal Hypervisor or native Hypervisor. It runs directly on the host hardware. Furthermore, it manages the guest operating systems and controls hardware.

Type 2 hypervisors run on a conventional operating system just as other computer programs do.

CO PO Mapping

Course Outcomes		Modules covered	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
CO1	Explain cloud computing, virtualization and classification of services of cloud computing	1,2	2	2	2	2	0	3	3	0	0	0	0	0	3	0	2	2
CO2	Illustrate architecture and programming examples in cloud	2,3,4	2	2	0	2	2	3	3	0	0	0	0	0	3	2	0	2
CO3	Describe the platforms for development of cloud applications with examples	4,5	2	3	3	3	2	3	3	0	0	0	0	0	3	2	0	2

COGNITIVE LEVEL	REVISED BLOOMS TAXONOMY KEYWORDS
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.

L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)				CORRELATION LEVELS	
PO1	Engineering knowledge	PO7	Environment and sustainability	0	No Correlation
PO2	Problem analysis	PO8	Ethics	1	Slight/Low
PO3	Design/development of solutions	PO9	Individual and team work	2	Moderate/ Medium
PO4	Conduct investigations of complex problems	PO10	Communication	3	Substantial/ High
PO5	Modern tool usage	PO11	Project management and finance		
PO6	The Engineer and society	PO12	Life-long learning		
PSO1	Develop applications using different stacks of web and programming technologies				
PSO2	Design and develop secure, parallel, distributed, networked, and digital systems				
PSO3	Apply software engineering methods to design, develop, test and manage software systems.				
PSO4	Develop intelligent applications for business and industry				
