



CCS Internal Question Paper Scheme and Solution

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Internal Assessment Test 1 – March – 2026

Sub:	Cloud Computing and Security				Sub Code:	BIS613D	Branch:	ISE
Date:	02.03.2026	Duration:	90 Min	Max Marks:	50	Sem / Sec:	VI/ A,B,C (SET-2)	

QN	Questions Answer any 5 full questions	Marks	OBE	
			CO	RBT
1.	Explain different software environments for distributed systems & cloud computing.	10	CO1	L2
2.	How do distributed systems support cloud computing? Illustrate with examples.	10	CO1	L2
3.	Discuss the impact of network technologies on cloud computing performance.	10	CO1	L3
4.	What are the different implementation levels of virtualization? Explain in detail.	10	CO2	L2
5.	How does virtualization improve resource management in cloud computing?	10	CO2	L2
6.	How do data centers contribute to cloud computing architecture?	10	CO3	L2

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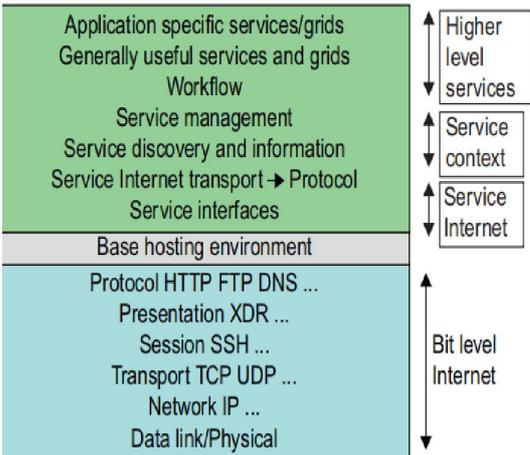
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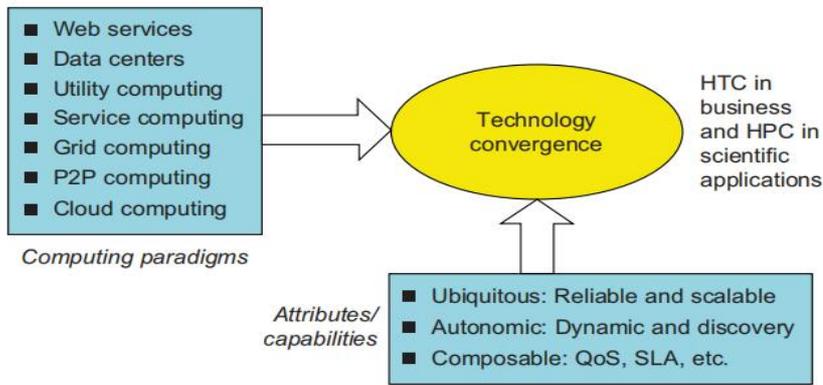
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1.	<p>Explain different software environments for distributed systems & cloud computing. (Explanation 5m + Figure 5m)</p> <ul style="list-style-type: none"> ✧ Figure shows layered architecture for distributed entities used in web services and grid systems. ✧ In grids/web services, an entity is, a service, a Java object, and a CORBA distributed object. ✧ These architectures build on traditional 7 Open Systems Interconnection layers. ✧ On top of this we have a base software environment, which could be .NET or Apache Axis for web services or JVM for Java. ✧ On top of this base environment one would build a higher level environment reflecting the special features of the distributed computing environment. ✧ This starts with entity interfaces and inter-entity communication, which rebuild the top 4 OSI layers but at the entity and not the bit level. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> ✧ The entity interfaces correspond to Web Services Description Language, Java method, and CORBA interface definition language specifications. ✧ These interfaces are linked with customized, high-level communication systems. ✧ These systems support features including particular message patterns, fault recovery, and specialized routing. ✧ Often, these systems are built on message-oriented middleware infrastructure. 	10	CO1	L2
2.	<p>How do distributed systems support cloud computing? Illustrate with examples. (Explanation with example 6m + Figure 4m)</p> <ul style="list-style-type: none"> ➤ Figure shows computing paradigms to help, study, distributed systems & their applications. ➤ These paradigms share some common characteristics. ✧ They are all ubiquitous. Reliability & scalability are 2 major design objectives. ✧ They are aimed at autonomic operations that can be self-organized to support dynamic discovery. ✧ They are composable with QoS and SLAs (service-level agreements). 	10	CO1	L2



3. Discuss the impact of network technologies on cloud computing performance. (Explanation 6m + Figure 4m)

10

CO1

L3

- Performance metrics are needed to measure various distributed systems.
- In a distributed system, System throughput is often measured in:
 - ❖ MIPS(Million Instructions Per Second),
 - ❖ Tflops (tera floating-point operations per second), or
 - ❖ TPS (transactions per second).
 - ❖ Other measures include job response time and network latency.
- Other performance-related metrics include:
 - ❖ QoS for Internet and web services;
 - ❖ System availability and dependability; and
 - ❖ Security resilience for system defense against network attacks.

Scalable performance implies that: system can achieve higher speed by adding more processors or servers, enlarging physical node's memory size, extending disk capacity, or adding more I/O channels.

- ❖ Fig: System scalability versus multiplicity of OS images based on 2010 technology.

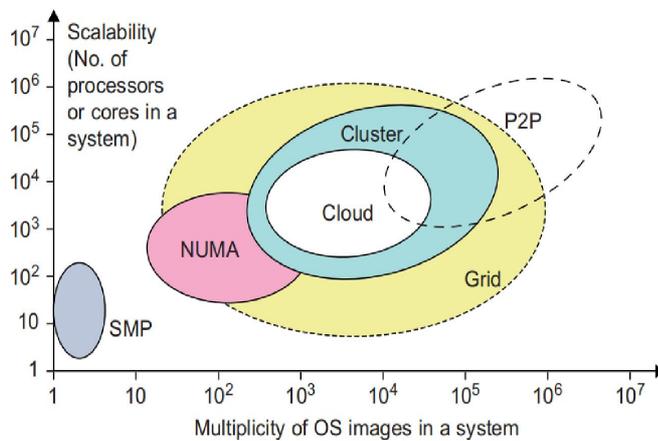
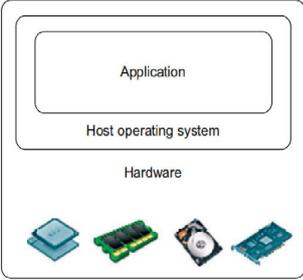
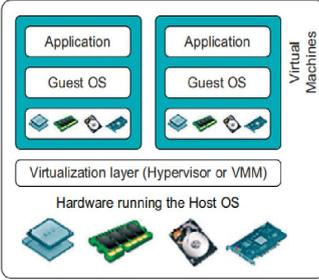


Fig. Scalable performance is estimated against the multiplicity of OS images in distributed systems deployed up to 2010

- ❖ OS image is counted by number of independent OS images observed in a cluster, grid, P2P network, or cloud.
- ❖ SMP(symmetric multiprocessor) & NUMA(nonuniform memory access) are included in comparison.
- ❖ SMP server has a SSI.
- ❖ NUMA are often made out of SMP nodes with distributed, shared memory.
- ❖ The cluster nodes can be either SMP servers or high-end loosely coupled machines.
- ❖ The number of OS images in a cluster is based on the cluster nodes concurrently in use.
- ❖ The cloud could be a virtualized cluster.
- ❖ The grid node could be a server cluster, or a mainframe, or a supercomputer,

	<p>or an MPP.</p> <ul style="list-style-type: none"> ◇ A P2P network can easily scale to millions of independent peer nodes, essentially desktop machines. 			
4.	<p>What are the different implementation levels of virtualization? Explain in detail. (Explanation 6m + Figure 4m)</p> <ul style="list-style-type: none"> ◇ A traditional computer runs with a host OS specially tailored for its hardware architecture, as shown in Figure. ◇ After virtualization, different user applications managed by their OS (guest OS) can run on same hardware, independent of host OS. ◇ This is often done by adding additional software, called a virtualization layer. ◇ This virtualization layer is known as hypervisor or virtual machine monitor (VMM). ◇ In VMs applications run with their own guest OS over the virtualized CPU, memory, and I/O. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>(a) Traditional computer</p> </div> <div style="text-align: center;">  <p>(b) After virtualization</p> </div> </div> <ul style="list-style-type: none"> ◇ The main function of software layer for virtualization is to virtualize physical hardware of a host machine into virtual resources. ◇ Virtualization software creates abstraction of VMs by interposing a virtualization layer at various levels of a computer system. <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>Application level</p> <p style="text-align: center;">JVM / .NET CLR / Panot</p> <hr/> <p>Library (user-level API) level</p> <p style="text-align: center;">WINE/ WABI/ LxRun / Visual MainWin / vCUDA</p> <hr/> <p>Operating system level</p> <p style="text-align: center;">Jail / Virtual Environment / Ensim's VPS / FVM</p> <hr/> <p>Hardware abstraction layer (HAL) level</p> <p style="text-align: center;">VMware / Virtual PC / Denali / Xen / L4 / Plex 86 / User mode Linux / Cooperative Linux</p> <hr/> <p>Instruction set architecture (ISA) level</p> <p style="text-align: center;">Bochs / Crusoe / QEMU / BIRD / Dynamo</p> </div> <ul style="list-style-type: none"> ◇ Common virtualization layers include: <ol style="list-style-type: none"> 1. instruction set architecture (ISA) level, 2. hardware level, 3. operating system level, 4. library support level, and 5. application level 	10	CO2	L2
5.	<p>How does virtualization improve resource management in cloud computing? (Explanation 5m + Figure 5m)</p> <ul style="list-style-type: none"> ◇ Each virtual cluster is formed with physical machines(PM) or VM hosted by multiple physical clusters. ◇ Provisioning of VMs to virtual cluster is done to have following properties: 	10	CO2	L2

- ✓ The virtual cluster nodes can be either PM or VM. Multiple VMs running with different OSES can be deployed on same physical node.
- ✓ VM runs with guest OS, that manages resources in PM, where VM is implemented.
- ✓ Purpose of using VMs is to consolidate multiple functionalities on same server. To enhance server utilization & application flexibility.

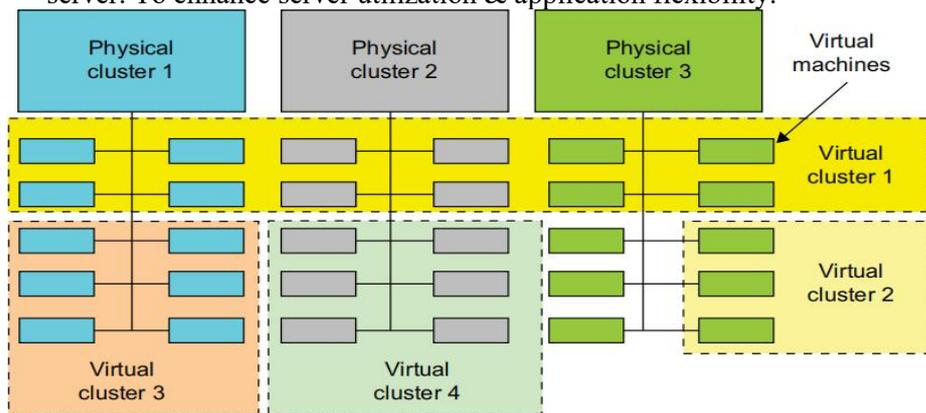
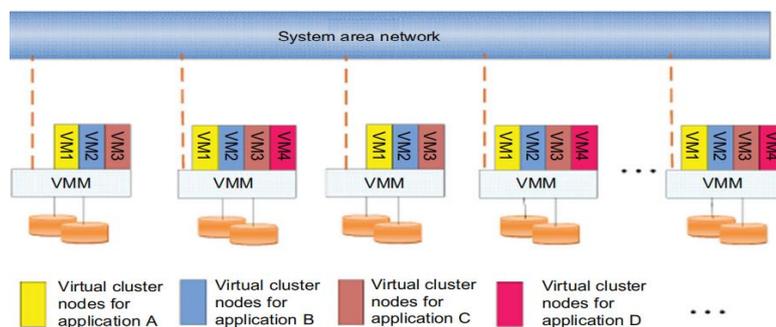


Fig: A cloud platform with four virtual clusters over three physical clusters shaded differently.

- ◇ VMs can be replicated in multiple servers for the purpose of promoting distributed parallelism, fault tolerance, and disaster recovery.
- ◇ The size of a virtual cluster can grow or shrink dynamically, similar to the way an overlay network varies in size in a peer-to-peer (P2P) network.
- ◇ The failure of any physical nodes may disable some VMs installed on the failing nodes. But the failure of VMs will not pull down the host system.
- ◇ In a virtual cluster system, it is quite important to store the large number of VM images efficiently.
- ◇ Figure shows the concept of a virtual cluster based on application partitioning or customization



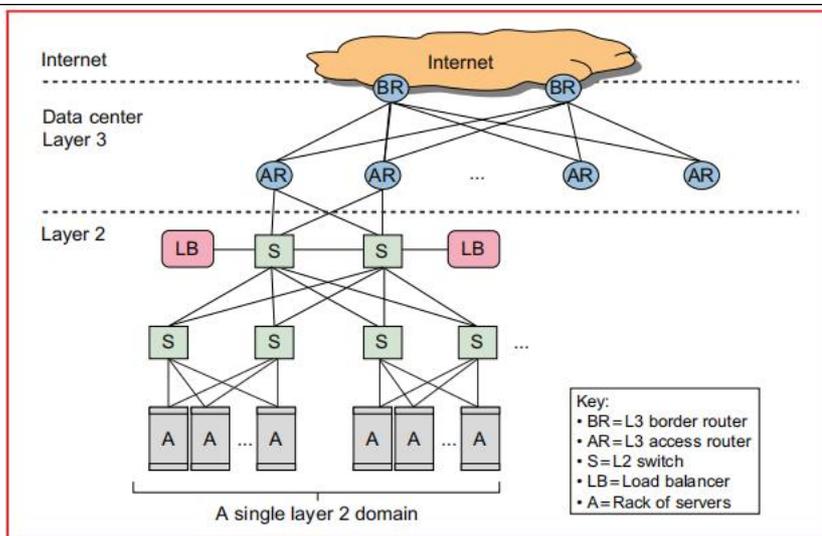
6. How do data centers contribute to cloud computing architecture?
(Explanation 6m + Figure 4m)

- ◇ The core of a cloud is the server cluster (or VM cluster). Cluster nodes are used as compute nodes.
- ◇ A few control nodes are used to manage and monitor cloud activities. The gateway nodes provide the access points of the service from the outside world.
- ◇ Data-center server clusters are typically built with large number of servers, ranging from thousands to millions of servers. Data-center networks are mostly IP-based commodity networks, such as 10 Gbps Ethernet network, which is optimized for Internet access.
- ◇ Figure shows a multilayer structure for accessing the Internet. The server racks are at the bottom Layer 2, and they are connected through fast switches (S) as the hardware core.
- ◇ The data center is connected to the Internet at Layer 3 with many access routers (ARs) and border routers (BRs).

10

CO3

L2



Standard data-center networking for the cloud to access the Internet.

- ❖ Cloud computing exploits many existing technologies.
- ❖ For example, grid computing is the backbone of cloud computing in that the grid has the same goals of resource sharing with better utilization of research facilities.
- ❖ Grids are more focused on delivering storage and computing resources while cloud computing aims to achieve economies of scale with abstracted services and resources.