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Internal Assessment Test 4 –Feb 2022

Sub:	Cloud Computing and its Applications				Sub Code:	15CS742/ 17CS742	Branch:	CSE		
Date:	04/02/2022	Duration:	90 mins	Max Marks:	50	Sem / Sec:	7D	OBE		
<u>Answer any FIVE FULL Questions</u>								MARKS	CO	RBT
1 (a)	<p>Define Cloud Computing, With a neat diagram, explain major deployment models for cloud computing</p> <p>Cloud computing refers to both the applications delivered as services over the Internet and the hardware and system software in the data centers that provide those services.</p> <p>The three major models for deploying and accessing cloud computing environments are public clouds, private/enterprise clouds, and hybrid clouds. Public clouds are the most common deployment models in which necessary IT infrastructure (e.g., virtualized datacenters) is established by a third-party service provider that makes it available to any consumer on a subscription basis. Such clouds are appealing to users because they allow users to quickly leverage compute, storage, and application services. In this environment, users’ data and applications are deployed on cloud datacenters on the vendor’s premises.</p> <p>Large organizations that own massive computing infrastructures can still benefit from cloud computing by replicating the cloud IT service delivery model in-house. This idea has given birth to the concept of private clouds as opposed to public clouds. In 2010, for example, the U.S. federal government, one of the world’s largest consumers of IT spending, started a cloud computing initiative aimed at providing government agencies with a more efficient use of their computing facilities. The use of cloud-based in-house solutions is also driven by the need to keep confidential information within an organization’s premises. Institutions such as governments and banks that have high security, privacy, and regulatory concerns prefer to build and use their own private or enterprise clouds.</p> <p>Whenever private cloud resources are unable to meet users’ quality-of-service requirements, hybrid computing systems, partially composed of public cloud resources and privately owned infra- structures, are created to serve the organization’s needs. These are often referred as hybrid Cloud computing clouds, which are becoming a common way for many stakeholders to start exploring the possibilities offered by cloud computing.</p>						[10]	CO2	L2	
2 (a)	<p>Name three cloud computing services it is possible to classify cloud computing services offerings into three major categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS).</p>						[03]	CO1	L1	
(b)	<p>Explain cloud computing architecture with the help of a diagram</p>						[07]	CO2	L2	

At the base of the stack, Infrastructure-as-a-Service solutions deliver infrastructure on demand in the form of virtual hardware, storage, and networking. Virtual hardware is utilized to provide compute on demand in the form of virtual machine instances. These are created at users' request on the provider's infrastructure, and users are given tools and interfaces to configure the software stack installed in the virtual machine. The pricing model is usually defined in terms of dollars per hour. Virtual storage is delivered in the form of raw disk space or object store. Virtual networking identifies the collection of services that manage the networking among virtual instances and their connectivity to the Internet or private networks. Platform-as-a-Service solutions are the next step in the stack. They deliver scalable and elastic runtime environments on demand and host the execution of applications. These services are backed by a core middleware platform that is responsible for creating the abstract environment where applications are deployed and executed. It is the responsibility of the service provider to provide scalability and to manage fault tolerance, while users are requested to focus on the logic of the application developed by leveraging the provider's APIs and libraries. This approach increases the level of abstraction at which cloud computing is leveraged but also constrains the user in a more controlled environment.

At the top of the stack, Software-as-a-Service solutions provide applications and services on demand. Most of the common functionalities of desktop applications—such as office automation, document management, photo editing, and customer relationship management (CRM) software—are replicated on the provider's infrastructure and made more scalable and accessible through a browser on demand. These applications are shared across multiple users whose interaction is isolated from the other users. The SaaS layer is also the area of social networking Websites, which leverage cloud-based infrastructures to sustain the load generated by their popularity.

Each layer provides a different service to users. IaaS solutions are sought by users who want to leverage cloud computing from building dynamically scalable computing systems requiring a specific software stack. IaaS services are therefore used to develop scalable Websites or for back-ground processing.



3 (a) Classify various types of cloud.

- ▶ Public Clouds
- ▶ Private Clouds
- ▶ Hybrid Clouds

▶ Community Clouds,

(b) Describe the pros and cons of virtualization

Pros:

- Managed Execution
- Portability
- Self-containment
- Efficient Usage of Resources

Cons:

- Performance degradation
- Inefficiency / degraded user experience
- Security holes and new threats

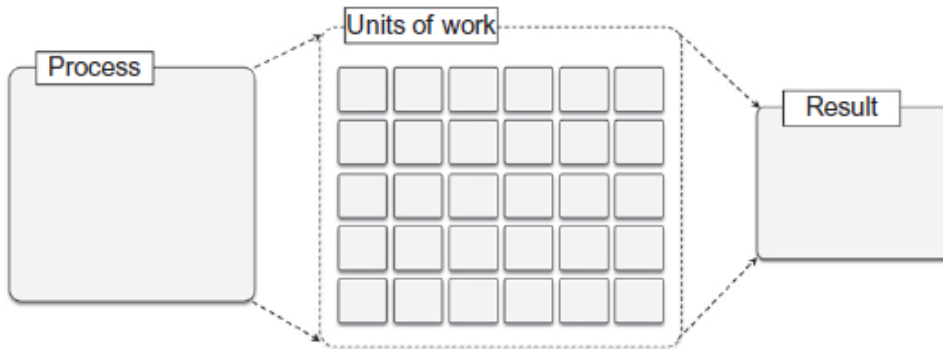
[04]

CO1 L2

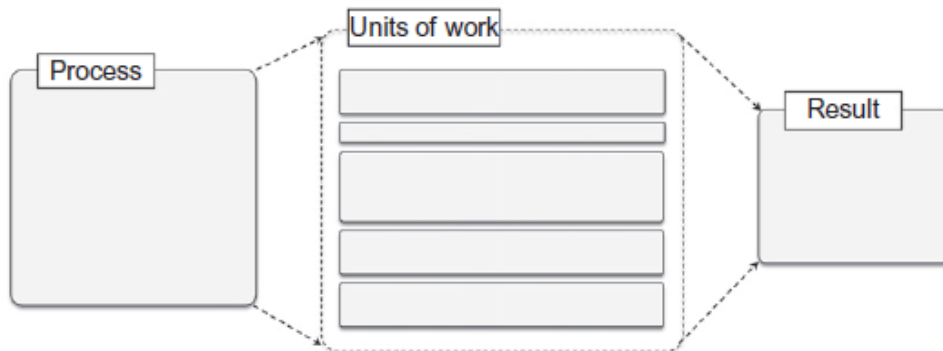
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CO1 L1

4 Distinguish between Domain and Functional Decomposition techniques with illustrative example



a. Embarrassingly parallel

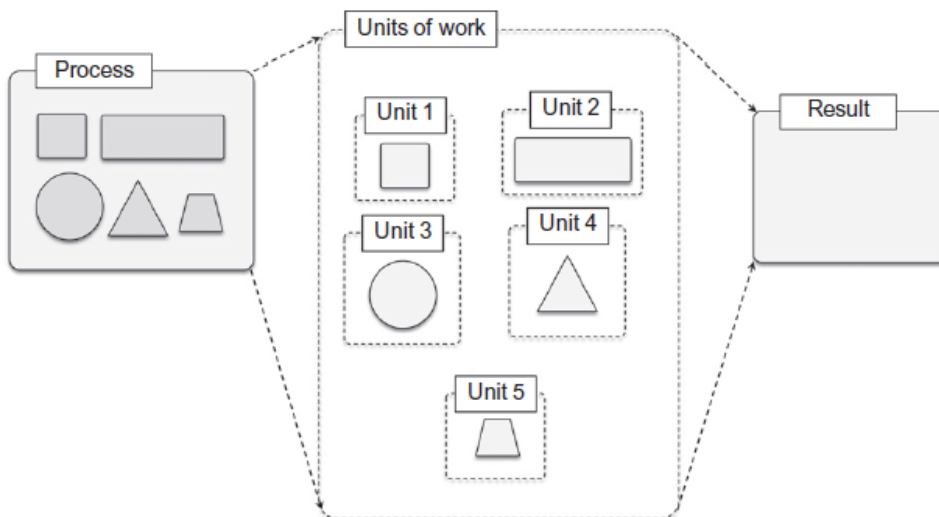


b. Inherently sequential

- ▶ Matrix multiplication using multiple threads.
- ▶ Obtained as a result of linear transformation of the original matrices.
- ▶ The **number of columns in the first matrix** must match the **number of rows in the second matrix**.

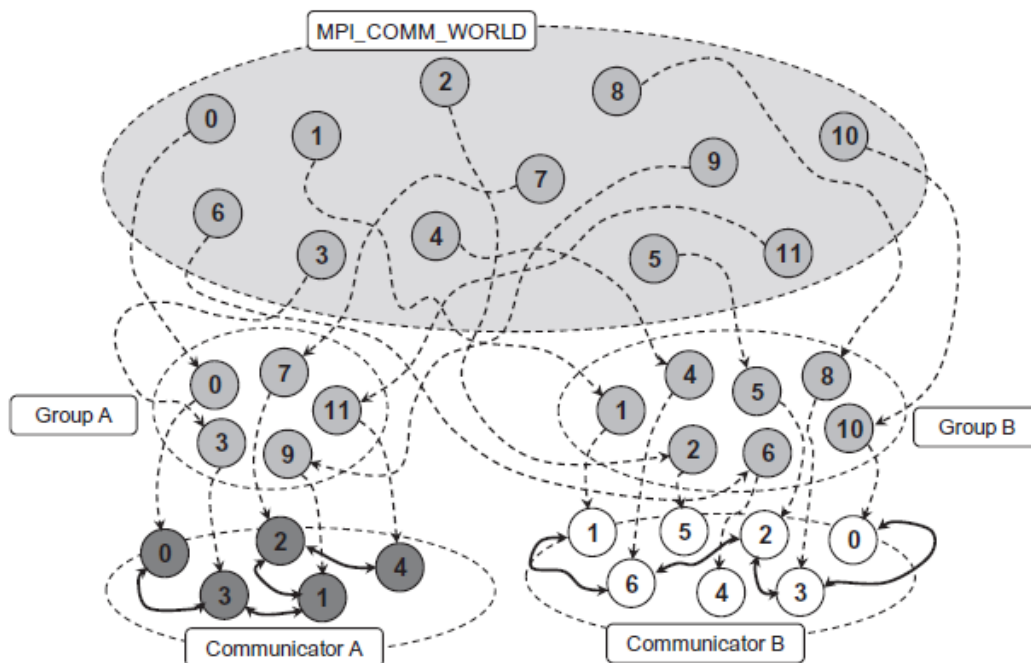
CO2 L3

- ▶ Computation is embarrassingly parallel
- ▶ The inner computation can be done in parallel using threads.
- ▶ <https://www.javaprogramto.com/2020/01/java-matrix-multiplication-threads.html>



sine, cosine, and tangent functions are performed in 3 separate threads and the results are put together.

- ▶ a function pointer is passed to each thread so that it can update the **final result** at the end of the computation.
- ▶ **Lock** ensures that a critical section can be accessed by one thread at a time and guarantees that the final result is updated.
- ▶ <http://manigandan2693.blogspot.com/2014/10/p-sinx-cosy-tanz-java-program.html>



Message Passing Interface(MPI) is a specification for developing parallel programs that communicate by exchanging messages.

- ▶ Compared to earlier models, MPI introduces the constraint of communication that involves MPI tasks that need to run at the same time.
- ▶ MPI has originated as an attempt to create common ground from the several distributed shared memory and message-passing infrastructures available for distributed computing.
- ▶ MPI provides developers with a set of routines that:
 - ▶ Manage the distributed environment where MPI programs are executed
 - ▶ Provide facilities for point-to-point communication
 - ▶ Provide facilities for group communication
 - ▶ Provide support for data structure definition and memory allocation
 - ▶ Provide basic support for synchronization with blocking calls

MPI applications that share the same MPI runtime are by default as part of a global group called `MPI_COMM_WORLD`

Within this group, all the distributed processes have a unique identifier that allows the MPI runtime to localize and address them

It is possible to create specific groups as sub- sets of this global group—for example, for isolating all the MPI processes that belong to the same application

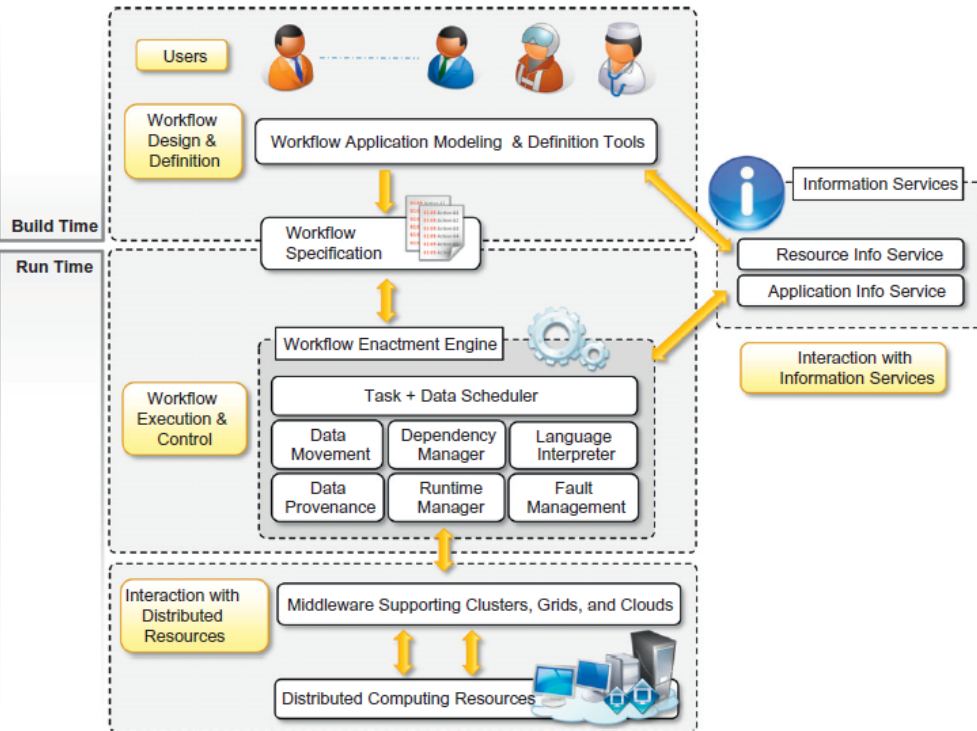
Each MPI process is assigned a rank within the group to which it belongs. The rank is a unique identifier that allows processes to communicate with each other within a group.

To create an MPI application it is necessary to define the code for the MPI process that will be executed in parallel

6 Describe the two workflow technologies for designing and executing workflow based applications

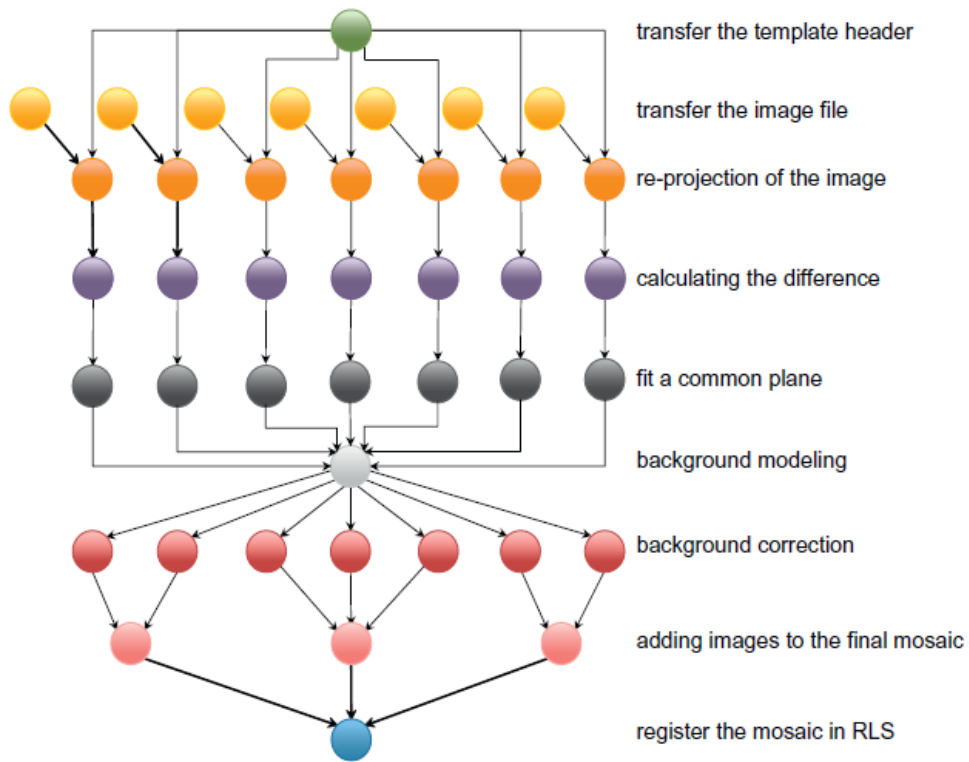
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CO2 L2



Design tools allow users to visually compose a workflow application

- ▶ normally stored in the form of an XML document
- ▶ controls the execution of the workflow by leveraging a distributed infrastructure
- ▶ Some frameworks can natively support the execution of workflow applications



An automation of a business process, in whole or in part, during which, documents, information, or tasks are passed from one participant (a resource, human or machine) to another for action, according to a set of procedural rules.

- ▶ DAG(Directed Acyclic Graph)

