St. MARTIN'S ENGINEERING COLLEGE

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ASSIGNMENT ANSWER BOOKLET

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Course : B-tech

Branch : CSE

Year : I/II/III/IV

Sem : I / II

Assignment : I / II

Subject Name : cloud computing

Last Date of Submission:

Actual Date of Submission :

MARKS AWARDED

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Shrey
Signature of the Student

Signature of the Evaluator

Start Writing from Here

1) Explain the different computing Paradigms & how they differ from cloud computing.

⇒ A computing Paradigm refers to the Fundamental model of how computing is performed & resources are utilized, over time, many Paradigms have been developed, each tailored for specific needs, ranging from traditional stand-alone systems to futuristic approaches like Quantum computing & Biocomputing.

1. Traditional / stand-alone computing :- • computers operated independently without external resource sharing.
• Data & applications were stored locally.
Ex:- Early desktop computers, mainframes.

Limitations:- 1) High cost
2) lack of scalability, no remote access.

2. Cluster Computing:- • Multiple computers (nodes) connected to work as a single system.
Ex:- Beowulf clusters.

3. Grid Computing:- • Distributed resources from different organizations combined to solve large scale problems.
Ex:- SETI@home project.

4. Utility Computing:- • computing resources provided like a public utility (electricity, water).
• Pay-per-use model.
Ex:- Early Amazon EC2 services.

5. Distributed Computing:- Tasks divided among multiple computers connected via a network.
Ex:- Online banking, search engines.

6. Parallel Computing:- • Single task broken into smaller subtasks executed simultaneously.
Ex:- Weather prediction, deep learning training.

7. Network Computing:- • Relies on network connections to access shared data, software or processing power. Ex:- Using a thin client to access applications on a central server.

8. Mobile Computing:- computing paradigm that allows data, voice & video transmission through mobile devices without being tied to a fixed location. Ex:- Smartphones, laptops with internet connectivity.

9. BioComputing:- Uses biological components (like DNA, proteins or cells) for computation instead of electronic circuits.
Ex:- DNA computing for solving mathematical problems.

10) Quantum Computing:- Uses quantum bits (qubits) instead of classical bits. Qubits can be exist in multiple states simultaneously & be entangled 2 enabling exponential speedups for certain problems.

11. optical computing:- Uses photons (light particles) instead of electrons to perform computation. Photons travel faster than electrons, reducing heat & increasing speed.

12. Nano computing:- Computing at the nanometer scale, using nanotechnology to build processors, circuits & storage devices.

13. Cloud computing:- Cloud computing evolved as an integration of earlier paradigms & offers computing as a service over the internet.

14) Network computing:- Network computing is a paradigm where multiple computers are connected through a network to share resources, data & applications.

* How CC Differs from other Paradigms:-

1. Cost Model:- Traditional paradigms require heavy hardware investment. Cloud is based on subscription or pay-per-use.
2. Scalability:- Cloud offers instant elasticity, while most paradigms are hardware-limited.
3. Accessibility:- Unlike cluster, grid or optical computing, cloud resources are available over the internet worldwide.
4. Ownership:- In cloud, users don't own infrastructure - it is managed by service providers.

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2. Describe the Cloud computing Architecture & its Key components.

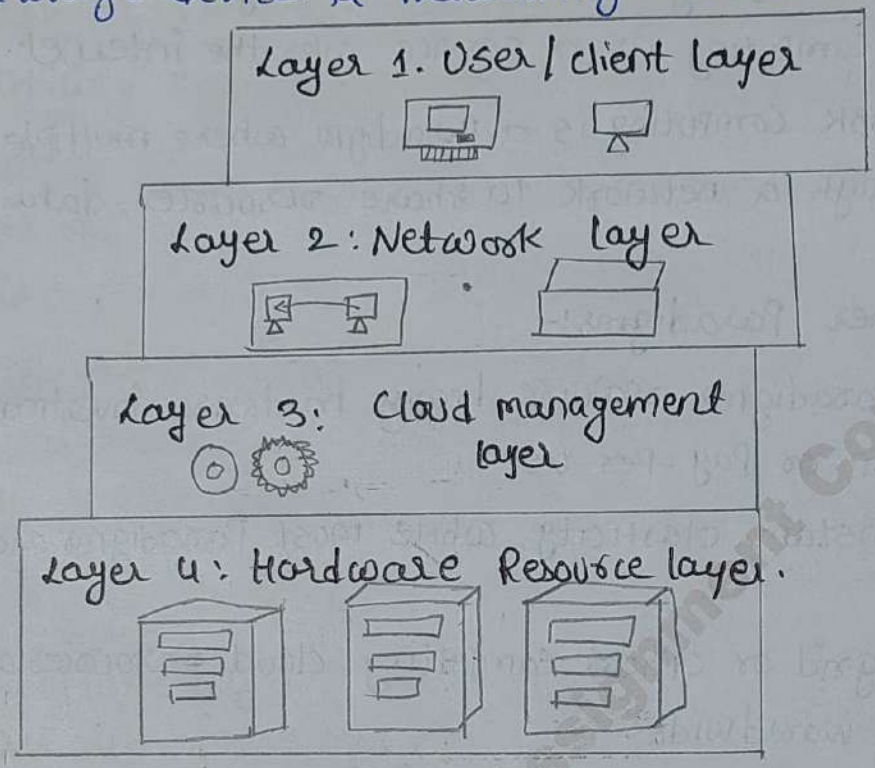
⇒ Cloud computing is the modern paradigm where computing services such as servers, storage, databases, networking & software are delivered over the internet.

1) Layer 1 (user / client layer):- This layer is the lowest layer in cloud Architecture. All the users or client belong to this layer. This is the place where the client/user initiates the connection to the cloud.

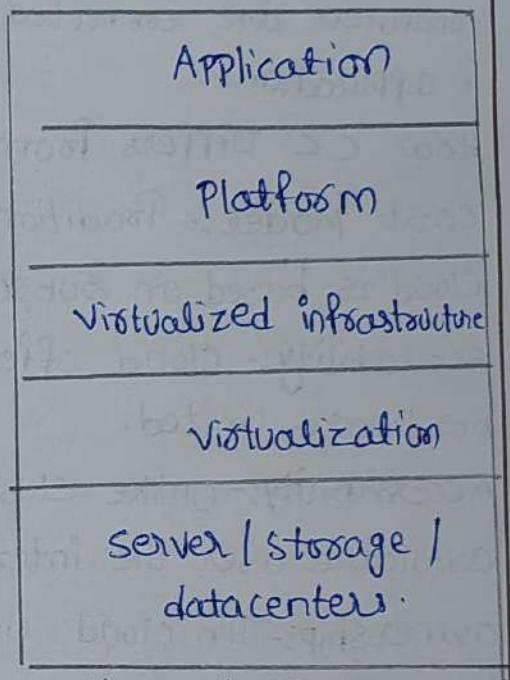
2) Layer 2 (Network Layer):- This layer allows the users to connect to the cloud. The whole cloud infrastructure is dependent on this connection where the services are offered to the customers.

3) Layer 3 (Cloud Management layer):- This layer consists of slw that are used in managing the cloud. This is brain of cloud computing. responsible for managing resources, services & operations.

4) Layer 4 (Hardware Resource Layer):- The foundation layer of the architecture. It includes Physical infrastructure such as servers, storage devices & Networking hardware.



* Cloud Architecture *



* Cloud structure.

* 5 components of the cloud :-

1. Application:- The upper layer is the application layer. In this layer, any applications are executed.
2. Platform:- The component consists of Platforms that are responsible for execution of application.
3. Infrastructure:- It consists of resources over which other components work.
4. Virtualization:- It is Process of making logical components of resources over the existing Physical resources.
5. Physical Hardware:- The Physical hardware is provided by server & storage units.

8. What are the Technological Drivers for Cloud computing? Explain any two in detail.

=> Cloud computing did not emerge overnight - It is the result of several technological advancements that made it possible to deliver computing as a utility over the internet. These enabling technologies are called Technological Drivers for cloud computing.

* Major Technological Drivers:-

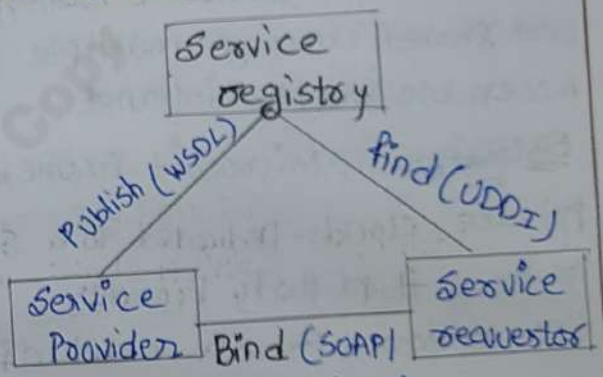
1) Service-oriented Architecture (SOA):- SOA is a s/w design approach where applications are built as a collection of loosely coupled services that can communicate with each other through standard protocols. It enables Modularity, reusability & interoperability of applications.

* Why it Drives CC:-

1. Flexibility
2. Integration
3. Scalability
4. Cloud service foundation.

* Technologies used by SOA:-

1. Web services.
2. SOAP
3. RPC
4. RMI-IIOP
5. REST
6. WCF



* Architectual model of SOA *

2) Virtualization Technology:- It is the Process of creating multiple virtual instances from a single physical machine by abstracting h/w resources such as CPU, memory & storage.

* Why it drives cloud computing:-

1. Resource Efficiency 2) Scalability 3) Isolation & Security 4) Cost saving

* Types:-

1) OS virtualization 2) server virtualization 3) Memory virtualization

4) Storage virtualization 5) Network virtualization 6) Application virtualization

4) Explain the different cloud Deployment models & Cloud service Models (Iaas, Paas, Saas) along with their characteristics & Suitable Examples.

=> Cloud computing offers different deployment models based on how the cloud infrastructure is owned, managed & accessed. Similarly it Provides service Models (Iaas, Paas, Saas) that define the level of control & responsibility b/w cloud Providers & users.

* Cloud Deployment Models:- This defines the environment in which the cloud is implemented. The main deployment models are:-

a) Public cloud:- owned & managed by third-Party Providers. Resources are shared among multiple organizations (multi-tenant).
- Accessible via the internet.
Ex:- Gmail, Microsoft Azure, AWS S3.

b) Private cloud:- Dedicated to a single organization. can be hosted on Premises or by a third Party Provider.
Ex:- VMware Private cloud, OpenStack.

c) Hybrid cloud:- Combination of public & Private Cloud. Sensitive data stays in Private cloud, while less critical workloads run in Public cloud.
Ex:- AWS outposts, Microsoft Azure hybrid cloud.

d) Community Cloud ... Shared by a group of organizations with similar requirements. Managed internally or by a third Party.
Ex:- Government or healthcare organizations sharing a cloud infrastructure

* Cloud Service Models:- Service models define the type of service Provided by the cloud & level of control the user has.

a) Infrastructure as a service (Iaas):- Provides virtualized hardware resources like servers, storage & networking.
Characteristics:- 1) Pay Per use for infrastructure
2) Scalable & flexible.

Ex:- Amazon EC2, Google Compute Engine, Microsoft Azure VM.

b) Platform as a Service (PaaS):- Provides a Platform for developers to build test & deploy applications without worrying about managing infrastructure.

Characteristics:-
- Simplifies App development.
- Automatic Scalability.

Ex:- Heroku, Google App Engine.

c) Software as a service (SaaS):- Provides ready-to-use software applications over the internet.

characteristics:-
- Accessible from any device via internet.
- Subscription based

Ex:- Gmail, Microsoft office 365, Salesforce, Dropbox.

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5) Explain the concept of virtualization & discuss programming Models for Cloud computing such as MapReduce & Cloud Haskell.

⇒ Virtualization:- It is a technology that allows the creation of multiple virtual instances of h/w, s/w or network resources on top of a single physical infrastructure.
- It abstracts physical resources & makes them available as VM to multiple users simultaneously.

* Types of virtualization:-
1. Hardware virtualization
2. Storage virtualization
3. Network virtualization.
4. Desktop/Application virtualization.

Benefits:-
- Resource Utilization
- Scalability
- Cost Reduction
- Isolation
- Flexibility.

* Programming Models:- It define how applications are written, executed & managed in a cloud environment.

a) MapReduce:- A Programming model developed by Google for Processing & generating large datasets in a distributed computing environment.

- It simplifies Parallel processing by breaking tasks into two phases:

1. Map Phase:- • input data is divided into smaller chunks.
   • Each chunk is processed in Parallel to generate key-value pairs.
2. Reduce Phase:- • The key value pairs from the map Phase are grouped by key.
   • The Reduce function processes these groups to produce final output.

b) Cloud Haskell:- It is a functional programming model for distributed & Parallel computing in cloud environments based on the Haskell language.

- It is designed for building scalable, fault-tolerant cloud applications.

Features:-

1. Concurrency:- Provides lightweight concurrent processes.
2. Abstraction:- Hides low level details of networking & Process management.
3. Fault Tolerance:- Supports recovery Mechanisms in distributed systems.

Ex:- A Cloud Haskell program can launch distributed systems processes across multiple servers to perform computations like load balancing or Parallel data analysis.