

**Mid Semester Assignment (Spring - 2020)**  
**Cloud Computing**

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**Total Marks: 30**

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**Note: Attempt all Questions. Answers should be in your own words. Plagiarism will not be tolerated, if detected, it will lead to failure.**

**Question No. 1:** (10)

- a. Explain essential characteristics of cloud computing.
- b. Explain in detail the key properties of cloud computing.

**Question No. 2:** (10)

- a. Explain in detail different service models of cloud computing.
- b. Explain in detail different deployment models of cloud computing.

**Question No. 3:** (10)

- a. Explain in detail roles and boundaries in cloud.
- b. Explain in detail cloud risk and challenges.

## **Question #1(a)**

Many business companies and organization are adopting and working through the cloud computing in their data houses.

The essential characteristics of the cloud computing model have since been redefined by the professionals and the experts, cloud computing is the model for enabling presence, convenient (appropriate), on-demand network access to a shared pool of configurable resources of the computer.

For example: (networks, servers, storage, applications and services)

Five essential characteristics are:

- On-demand self-service.
- Broad network access.
- Resource pooling.
- Rapid elasticity.
- Measured service.

### **Essential Characteristics**

#### **1. On-demand self-service.**

A consumer can provision computing potentialities one-sidedly, such as server time and network storage. Which is needed automatically without and human interaction in between each service provider.

#### **2. Broad network access.**

Potentialities are available over the network and accessed through standard mechanisms which are pre-defined that advance use by assorted thin or thick client platforms.

For example: (mobile phones, tablets, laptops, and workstations).

#### **3. Resource pooling.**

In resource pooling the computational resources of a provider are pooled to give an aggregate of consumers and it can be utilized by multi-tenancy pattern with various substantial and essential resources dynamically that are allocated and reallocated as the consumer requires. There is an individual sense of location that the consumer usually has no control or knowledge over the exact location of the resources that are provided, but the customer may be able to specify the location at higher levels of preoccupation for example (country, state, city or datacenter)

Example of the resources counts storage, processing, memory and the network bandwidth.

#### **4. Rapid elasticity.**

Rapid elasticity's potentialities can be facilitated and liberated automatically, in some scenarios, to scale quickly outward and inward comparable with the need. The potentialities to the customer are available for facilitate often seems to be unlimited and can be adjusted at any size or any time

### **5. Measured service.**

Cloud computing systems controls and optimize resources automatically by using leverage and metering potentialities at some level of abstraction different to the type of service. For example, storage, processing, bandwidth and users with active accounts.

### Question # 1(b)

- **Cloud computing is user centric.**

Clouds definitely provide a valuable service to the end user and these are becoming the next personal servers and also computing devices. Users create their environment on cloud services to store their important files and the most important backups, in case if a user loses all his data from the device and he has saved it on the cloud, the user can recover and access his data again.

- **Task centric.**

Task centric is based on that what the user wants to achieve rather than achieving it through any particular software, hardware or network infrastructure. User does not have to buy or install anything before using a cloud computing service.

- **Powerful.**

Powerful means that we can gather many computers to make a single virtual personal computer and work on it with the help of cloud, and can perform tasks which are impossible to do with a single personal computer.

- **Accessible.**

Accessible means that user can retrieve information from cloud and can retrieve from multiple repositories. The data information can be retrieved by a desktop computer. Meanwhile the data which is saved in the cloud can be accessed from anywhere by the user.

- **Intelligent.**

Cloud computing is intelligent because all the data is saved in the cloud. Data mining and analysis are necessary for cloud to access the data in intelligent manner.

- **Programmable.**

Programmable means that the task necessary with cloud computing must be automated, if the data is stored in one single personal computer in the cloud and that pc goes offline, so the cloud's programming will automatically redistribute the computer's data to a new computer in the same cloud. Which means it is not necessary to have the same computer for accessing the data, it can be accessed from other computers too.

## Question # 2(a)

There are three types of cloud service models

- SaaS (Software as a Service)
- IaaS (Infrastructure as a Service)
- PaaS (Platform as a Service)

Each cloud models have different sets of advantages that can accomplish the needs of different businesses.

Picking between these models needs an understanding towards these models, evaluating the requirements and seeking out how the selected model can improvise the intended pairs of workflows.

Following is a description of different types of models and their pros.

- **SaaS.**

SaaS or software as a service is a model that provide quick access to cloud-based web applications. The developer controls the whole computing stack through which a web browser can be accessed. These applications run on the cloud and can be used by free with a limited access and can be used by paid licensed subscription.

SaaS does not need to be installed or downloaded in the existing computing infrastructure. This removes the need for installing application on each of the computers with the maintenance and support taken over by the developer.

Some of the examples of SaaS includes google G suit, Microsoft office 365, dropbox etc.

**Pros:**

- 1) Affordable
- 2) Accessible anywhere
- 3) Fast and ready to use.

- **IaaS.**

IaaS or infrastructure as a service is basically an essential provision of computing resources over the cloud. IaaS cloud provider can give the entire set of computing infrastructure such as storage, servers, networking hardware including maintenance and support.

Businesses can make computing resources of their requirement without need to install hardware on their premises optional.

Some of the IaaS cloud providers are google compute engine, amazon web services, Microsoft azure etc.

**Pros:**

- 1) Reduces the cost
- 2) Scalability enhancement
- 3) Easy to deploy

- **PaaS.**

PaaS or platform as a service is actually cloud base through which different applications for business are developed, tested and organized. Running on PaaS simplifies the process of enterprise software development. PaaS provides a good space for developing and testing application in virtual runtime environment.

The whole set of resources given in the form of servers, storage and networking are easily manageable by the company or by the platform provider.

Examples for PaaS are Google App Engine and AWS elastic beanstalk.

**Pros:**

- 1) Reduced development time
- 2) Supports multiple programming languages
- 3) Collaboration enhancement

## Question # 2(b)

### Cloud Computing and Cloud Deployment Models

Cloud computing refers to delivering the on-demand services on the internet like storage, hosting, database, analytics, applications and servers etc. It allows the companies rental access to a different type of services from cloud service provider. Which include the payment for everything which service is providing, without spending resources on expensive IT infrastructures and maintenance.

On the other hand, service providers charge the companies based on service storage usage of the data and lowering the expenses that are interlinked with on premise systems. Cloud service providers give their clients the possibility to focus on the core business instead of wasting resources on complex infrastructures.

There are different cloud deployment models:

- Private Cloud
- Public Cloud
- Hybrid Cloud
- Community Cloud

#### Private Cloud

Private cloud is a cloud in which deployment model is only for single organization, whether the company's on-site data center is physically located, or the third-party provider hosts or manages it. Private cloud shares no resources with other organizations, and the company is entirely responsible for the management, maintenance and the regular updates. Which can be more expensive than public cloud.

##### ❖ **Merits:**

1. Customization of the cloud with more possibilities.
2. High security and privacy.
3. Greater control over the server.

##### ❖ **Demerits:**

1. Accessing data from remote areas can be difficult.
2. High costs on private cloud infrastructure.
3. Maintenance responsibility.

#### Public cloud

A cloud is said to be public when the services are made by the third-party providers over a network that is used publicly, which means the hardware, software and the network devices shares the same as the other client of the same provider.

Public and private clouds differentiate as one has the responsibility over cloud's hosting and management. And as the public cloud rents a space on the cloud from a third-party provider, cost and the maintenance will be assumed as a whole of the infrastructure. The client who is paying for such service has no responsibility of management of the cloud, it is only used to store the data as the client pays for it.

❖ **Merits:**

1. Time reduction in developing, testing and launching of new products.
2. Cost effectiveness
3. Payment on scalability

❖ **Demerits:**

1. Higher security risks due to shared resources.
2. Networks performance can be affected.
3. Lack of customization

### Hybrid Cloud

As the name clarifies it that it is the combination of private and public cloud deployment models. It provides the benefits of both infrastructure to the company.

Companies are capable of shifting data and applications between private and public clouds, depending on the purposes.

Hybrid model offers cloud bursting option in which resources can be shifted if any problem occurs.

❖ **Merits:**

1. Flexibility and control.
2. Cost effectiveness.
3. Enhanced organizational agility.

❖ **Demerits:**

1. More maintenance is required.
2. Initial costs for activating both infrastructures can be really high for many organizations.
3. Data and application integration.

### Community Cloud

Community cloud is that cloud in which the infrastructure is shared in between many organizations with a specific community and common interests. Such as security, compliance, regulations etc. whether managed and hosted internally or by the third-party. This cloud is used by the organizations that have common interests.



### Question # 3(a)

#### Roles

- **Cloud provider**

Cloud provider is the one who provides cloud-based IT resources to the organization. Making cloud services available to cloud consumers is the responsibility of the organization, which assumes the role of cloud provider. Requirement management and administrative duties to ensure the on-going operation of the complete cloud infrastructure are the furthermore tasks of cloud provider.

IT resources that are sold to the cloud customer on lease, the cloud provider owns them. And he can also resell those resources when the contract is over.

- **Cloud consumer**

Cloud consumer can be an organization or a human who has a contract with the cloud provider to use the IT resources provided by the cloud provider.

The cloud consumer (an organization or a human) interacts with the cloud service from a cloud provider and the cloud service consumer is granted to access the cloud service.

- **Cloud service owner**

Cloud service owner is the person or the organization that owns a cloud service legally. The cloud service owner can be the cloud consumer when it launches its own service in a cloud or a cloud provider becomes a cloud service owner if it launches its own cloud service for other cloud consumers to use.

- **Cloud resource administrator**

A cloud resource administrator is the person or organization that is responsible for a cloud-based IT resources along with cloud service's administration. The cloud resource administrator may be working with the cloud consumer organization IT resources that belongs to the cloud consumer, or a cloud resource administrator can be with a cloud provider organization for which it can administer the cloud provider's internally and externally available resources.

- **Additional resource**

Additional resources have different supplementary roles:

Cloud Auditor – Cloud auditor's responsibilities are associated the evaluation of security controls, privacy impacts and performance.

Cloud Broker – Cloud broker manages and negotiates the usage of cloud services between cloud consumers and cloud providers.

Cloud Carrier – The cloud carrier provides wire-level connectivity between cloud consumers and cloud providers.

#### Boundaries

- **Organizational boundary**

Organizational boundary of cloud consumer and cloud provider is a set of IT resources which are surrounded and shown by physical perimeter.

- **Trust boundary**

Trust boundary is a part of cloud environment in which the role of cloud consumer accesses the cloud-based IT resources. To include the cloud environment, trust boundary encompasses the organizational boundaries of the cloud provider and the cloud consumer.

### Question # 3(b)

#### **Risks of Cloud Computing:**

The risk involving cloud computing are:

- **Availability risk.**

If the server is slow there might be a chance of server to timeout and the cloud developer might lose a customer.

- **Maintenance risk.**

If the cloud storage gets corrupted there is a chance that the stored data might be lost.

- **Business and client risk.**

There a risk of security breaches if the server is not much secured and maintained, due to which there is a chance of data lost and the server might get hacked.

#### **Challenges of Cloud Computing:**

There are many challenges that can be faced during cloud computing:

- **Portability.**

It requires constant internet connection which means that if there is a shortage in electricity the server might disconnect.

- **Performance.**

Cloud requires high speed internet connection which means that a low speed internet connection might slow down the server.

- **Interoperability.**

As there are limited features on cloud it might be challenging for the developer to add those feature that can satisfy the customer.