

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

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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.

Ans:

### Cloud Computing

The large group of interconnected personal computers or network servers. They can be public or private. In other words cloud computing refers to storing and accessing data on internet instead of hard drive. Cloud computing is like the electricity grid where resources, softwares and information are share through internet.

Here we are going to discuss essential characteristics of cloud computing.

**i. On-demand self-service**

The resources of cloud computing can be provided without man interaction from service provider. Storage space, virtual machine instances, database instances can be the resources of cloud computing.

**ii. Broad Network Access**

Vast number resources of cloud computing are available on the network and can be accessed from various customer platforms. High broadband communication links such as internet which is used to access globally and LAN is used for private clouds

**iii. Resource pooling**

When multiple customers are serviced from the same application or same platform is called resource pooling. Resource pool can be very large and flexible enough that provide service to multiple client requirements and to provide for economy of scale. Resource pooling should not impact performances of critical manufacturing applications.

**iv. Rapid elasticity**

The most interesting thing of cloud computing is that it quickly provide resources when manufacturing organization need them. It is also quickly removed when it is not needed. The cloud computing can scale up and down fastly which is the key feature of cloud computing. The usage, capacity, and therefore cost, can be scaled up or down with no additional contract or penalties.

**v. Measured service**

Cloud resources whether server instances that are running or storage in the cloud are monitored, measured and reported by the cloud service provider.

**b. Explain in detail the key properties of cloud computing.**

**Ans:** Cloud computing let us enable convenient, on demand network access a shared pool of configurable computing resources such as networks, servers, storage, applications, and services). Other benefits include:

**i. Scalable:**

Computing resources can be rapidly provisioned and released with less management effort and service provider interaction.

**ii. Reliable:**

In cloud computing we can dynamically allocate and release by fully automated procedure.

**iii. Agile and Elastic**

We can access network from anywhere through internet connection. Economic scales and efficient infrastructure can be made from a common pool.

**iv. Availability and Accessibility**

It can be accessed from anywhere through self serve web layout.

**Question No. 2:**

(10)

**a. Explain in detail different service models of cloud computing.**

**Ans:** As we know that cloud computing is based on service models. There are three basic server models:

**i. Software as a Service (SaaS)**

SaaS is known as on-demand-software. We can also call it software distribution model. This is the model, where the applications are hosted by a cloud service provider and publicized to the customers over internet. Cloud server keep the associated data and software in center in SaaS model. CRM, Office Suite, Email, games, etc. are the software applications which are provided as a service through Internet represents best the SaaS model. What makes SaaS best choice is its cost and the drawback is that it is totally dependent on internet. It is difficult to switch in SaaS modeling

**ii. Platform as a Service (PaaS)**

PaaS is basically a platform which provide development to programming developers. Programmers can create , test, run and manage applications using PaaS. PaaS provides runtime environment for application development and deployment tools. Google Apps Engine(GAE) and Windows Azure are the common examples of PaaS.

**iii. Infrastructure as a Service (IaaS)**

IaaS provides us a platform for cloud computing infrastructure like server, storage, network and operating system. One can access above resources through internet. In IaaS, one can buy complete resources instead purchasing server, software, datacenter space or network equipment.

**b. Explain in detail different deployment models of cloud computing.**

**Ans:** A cloud deployment model refers to configuration of environment parameters such as the accessibility and proprietorship of the deployment infrastructure and storage size. There are four main cloud deployment models:

**i. Public cloud**

As from the name it is clear that it is available to the general public in which data is created and stored in third party servers. In public cloud server infrastructure belongs to service providers who manage them that's why user companies do not buy and maintain hardware. Provider companies offer resources as a service both free of charge or on a pay-per-use basis via the Internet connection. Users can scale resources when required. Amazon Elastic Compute Cloud (Amazon EC2), Microsoft Azure, Google App Engine, IBM Cloud, Salesforce Heroku are the common example.

**ii. Private cloud**

The architecture of Private cloud is very similar to public cloud hence there is no big technical difference. The only difference is the public is available to general public while private is available to specific company who owns it. Only one organization uses this deployment model to run its workloads, and the server can be hosted externally or on the premises of the user company. Regardless of their physical location, these infrastructures are maintained on a designated private network and use software and hardware that are intended for a specific company.

**iii. Community Cloud**

A community deployment model is closely similar to private cloud but there is only one difference. In private cloud there is only one user while in community cloud there is set of users. In community model several organizations of the same background share the infrastructure and related resources. Security, privacy and reliability are the characteristics that makes it first choice however it is costly in comparison with public one.

**iv. Hybrid Cloud**

Hybrid cloud is the combination of all three above mentioned deployment models public, private and community ones. Companies to mix and match the facets of all three types that best suit their requirements. As an example, a company can balance its load by locating mission-critical workloads on a secure private cloud and deploying less sensitive ones to a public one. Hybrid cloud deployment model not only safeguards and controls strategically important assets but does so in the most cost- and resource-effective way possible for each specific case.

Question No. 3:

(10)

a. Explain in detail roles and boundaries in cloud.

**Ans:** Companies and users do assume different types of pre-defined roles depending on how they relate interact with a cloud and its hosted IT resources. Each of the upcoming roles participates in and carries out responsibilities in relation to cloud-based activity.

Following are the roles and their main interactions:

**i. Cloud Provider**

The cloud provider refers to the organization that provides cloud based IT resources. The organization plays the role of cloud provider that is responsible for making cloud service available to cloud consumers according to the agreed SLA guarantees. The cloud provide is also responsible for management and administrative duties to ensure the on-going operation of the overall cloud infrastructure.

**ii. Cloud Consumer**

An organization that has formal contract or arrangement with a cloud provider to use IT resources made available by the cloud provider. Specifically, the cloud consumer uses a cloud service consumer to access a cloud service

**iii. Cloud Service Owner**

The person or organization that legally owns a cloud service is called a cloud service owner. The cloud service owner can be the cloud consumer, or the cloud provider that owns the cloud within which the cloud service resides. A cloud consumer that owns a cloud service hosted by a thirdparty cloud does not necessarily need to be the user (or consumer) of the cloud service. Several cloud consumer organizations develop and deploy cloud services in clouds owned by other parties for the purpose of making the cloud services available to the general public.

**iv. Cloud Resource Administrator**

A cloud resource administrator is the person or organization responsible for administering a cloud-based IT resource (including cloud services). The cloud resource administrator can be (or belong to) the cloud consumer or cloud provider of the cloud within which the cloud service resides. Alternatively, it can be (or belong to) a third-party organization contracted to administer the cloud-based IT resource.

**v. Additional Roles**

The NIST Cloud Computing Reference Architecture defines the following supplementary roles:

- **Cloud Auditor**

A third-party (often accredited) that conducts independent assessments of cloud environments assumes the role of the cloud auditor.

- **Cloud Broker**  
This role is assumed by a party that assumes the responsibility of managing and negotiating the usage of cloud services between cloud consumers and cloud providers.
  - **Cloud Carrier**  
The party responsible for providing the wire-level connectivity between cloud consumers and cloud providers assumes the role of the cloud carrier.
- vi. **Organizational Boundary**  
An organizational boundary represents the physical perimeter that surrounds a set of IT resources that are owned and governed by an organization. The organizational boundary does not represent the boundary of an actual organization, only an organizational set of IT assets and IT resources. Similarly, clouds have an organizational boundary.
- vii. **Trust Boundary**  
When an organization assumes the role of cloud consumer to access cloud-based IT resources, it needs to extend its trust beyond the physical boundary of the organization to include parts of the cloud environment. A trust boundary is a logical perimeter that typically spans beyond physical boundaries to represent the extent to which IT resources are trusted. When analyzing cloud environments, the trust boundary is most frequently associated with the trust issued by the organization acting as the cloud consumer.

**b. Explain in detail cloud risk and challenges.**

**Ans: Top Risks in Cloud Computing**

- i. **Unauthorized access:** Customer and business data can be compromised by unauthorized access. Malware can also be a reason for compromization of data.
- ii. **Security risks:** When vendor provide sensitive service for your business and store sensitive data such as payment data and mailing data which you are placing your life in vendor's hand and you don't know how clean these hands are.
- iii. **Lack of Control:** Vendor is a controller if you are using cloud service provider. Many things can happen in this case, for example you can be forced to pay double and your data can be held hostage.

**Top Challenges in Cloud Computing**

- i. **Affordability:** Cloud computing itself is affordable, but tuning the platform according to the company's needs can be expensive especially for small scale projects.
- ii. **Reliability:** Technical service provider are as important as price and it must be available when you need them.
- iii. **Downtime:** Downtime is also a challenge of cloud technology and companies with an untrustworthy internet connection probably want to think twice before adopting cloud computing.

