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.
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.

Q. 1 part a:

Answer;

Essential characteristics of cloud computing;

Cloud model is composed of five essential characteristics:

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

On-demand self-service;

- A user can individually provide computing capabilities, such as server time and network storage, automatically without the need for human interaction with each service provider.

Broad network access;

- Experiences are presented over the system and retrieved through standard mechanisms that sponsor use by heterogeneous thin or thick consumer platforms (e.g., mobile phones, tablets, and laptops etc.).

Rapid elasticity;

- Skills can be elastically provisioned and free range, in some cases its done automatically, to scale quickly outward and inward equally with demand.
- To the customer, the skills are available for provisioning often perform to be unlimited and can be taken in any quantity at any time.

Resource pooling;

- The suppliers of computing resources are pooled to attend multiple clients using a multi-tenant model, with different physical and virtual resources are dynamically allocated and relocated according to the customer request.

- There is a logic of place independence that usually the client has no control or knowledge over the exact position of the provided resources but may be capable to identifying the situation of a higher level of concept (e.g., country, state or datacenter). Examples resources contain storage, dealing out, and system bandwidth.

Measured Services;

- Cloud systems automatically control and adjust the resources is used to take advantage of a measure capability at some level of abstraction applicable to the type of service (e.g., storage, bandwidth and active user accounts and processing.
- Resource utilization can be monitored, controlled and informed, providing transparency to the supplier and the consumer who used it.

Q1 part b:

Key properties of cloud computing;

- Cloud Computing Is User Centric
- Cloud Computing Is Powerful
- Cloud Computing Is Task-Centric
- Cloud Computing Is Accessible
- Cloud Computing Is Intelligent
- Cloud Computing Is Programmable

Cloud computing is user centric;

- Once as a consumer is connected to the cloud, documents, messages, images, applications, whatever is safe there, Becomes an option for the user to access them.
- In addition, not only is the data, but the user can also share it with others.
- In effect, any device that accesses your data in the cloud also becomes yours and you can use it normally.

Cloud computing is powerful;

- Concerning hundreds or thousands of computers organized in a cloud makes a treasure of computing power incredible with a particular desktop PC.

Cloud computing is task centric;

- Instead of focusing on the application and what it can do for us, the focus is on what one need done and how the application can do it for us.
- Traditional applications—word processing, spreadsheets, email, and so on—are becoming less important than the documents they create.

Cloud Computing Is Accessible;

- As data is put in storage in the cloud, consumers can rapidly recover more information from multiple repositories.

- We are not limited to a single source of data, as we do with a desktop PC.

Cloud Computing Is Intelligent;

- All the several data kept on the computers in a cloud; data mining and examination are needed to access that material in an intelligent way.

Cloud Computing Is Programmable;

- Several of the tasks required with cloud computing need be programmed. For example, to care for the integrity of the information, data kept on a single computer in the cloud must be genuine on other computers in the cloud.

- If one computer goes offline, the cloud's programming automatically restructures that computer's data to a new computer in the cloud.

Q2 part a;

Service models of cloud computing;

There are three types of service models of cloud;

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

These cloud models, assessing your requirements and discovering how the selected model can send your planned set of workflows. The following is a brief description of the three types of cloud models and their benefits.

SaaS (Software as a Service);

- SaaS or Software as a Service is a model that gives us quick entrance to cloud-based web applications.
- In software as a service there is no need to install on PCs.
- It is mostly used by the end user.
- The users have to utilize the software.
- Servers/Resources are managed by venders.
- These applications run on the cloud and you can use them by a paid licensed subscription or for free with limited access.
- For using the software the end user must have the strong internet connection.
- Software as a service is the platform independence.

Benefits

Affordable;

- SaaS is affordable as it reduces the costs complex in the consumption, installation, repairs and upgrades of computing hardware.

Anywhere Accessibility;

- With SaaS, you can right to use the services from anywhere using any device such as smartphones, which eliminates the limitations set by on principle software.

Ready to Use;

- You can rapidly set up SaaS services so that they become useful in no time. All it takes is that you sign up for the service to get right to use fast and powerful computing resources.

IaaS (Infrastructure as a Service;

- The vender provides the IP address to the end user. Whenever a client's demanding for IaaS, which infrastructure is provided to the user they also give related IP address to the end user.
- An IaaS cloud provider can give you the complete choice of computing infrastructures such as storage, servers, networking hardware along with maintenance and support.

- IaaS or Infrastructure as a Service is generally a virtual providing of computing resources over the cloud.
- The two prime features “Enhanced scalability and flexible” are also be provided by IaaS cloud provider.
- However, the only disadvantage with IaaS is that it is much costlier than SaaS or PaaS cloud models.
- It can be normally used by system administrative.
- Operating system can give access to the client in this service.

Benefits;

Minimize Costs

- Organizing an IaaS cloud model reduces the needs to install on-premise hardware that moderates the costs.

Enhanced Scalability

- As the most elastic cloud computing model, IaaS agrees you to scale the computing resources up or down based on demand.

Simple Deployment

- IaaS lets you easily arrange the servers, processing, storage, and networking to make it up and running in no time.

PaaS (Platform as a Service);

- It can normally use by the developers.
- Operating system cannot be access in this service, only provide access to the use interface.
- The platform seems as a runtime environment use for to develop an application and deploy an application.
- The tools of development and deployment an application can also by provide be provided by the vender.
- No need to purchase an expensive hardware and software because they all are provided by the vendor.

Benefits;

Minimal Development Time;

- PaaS reduces the progress time since the vendor provides all computing resources like server-side components, which make things easier the method and increases the focus of the development team.

Multiple Programming Language Support;

- PaaS offers support for multiple programming languages, which a software development company can use to build applications for different projects.

Enhanced Collaboration;

- With PaaS, your business can advantage from having improved collaboration, which will help to participate your team spread across various locations.

Q2 part b;

Deployment models of cloud computing;

Public Cloud;

- This type of cloud services is provided for public use.
- Consumers have no control over the location of the organization.
- It is based on a shared cost model for all the users.
- Public deployment models in the cloud are perfect for organizations with increasing demands.
- It is also popular among businesses of all sizes for their webmail, and storage of non-sensitive data.

The advantages of the Public cloud are:

- Flexibility
- Reliability
- High Scalability
- Low cost
- Place independent

Disadvantages;

- Less Secure
- Poor Customizable

Private Cloud;

- It is a cloud-based structure used by stand-alone organizations.
- It offers greater control over security.
- The information is backed up by a firewall and internally, and can be

held internally or externally.
- Private clouds are perfect for organizations that have high-security requirements, high management demands, and availability requirements.

The advantages of using a private cloud are:

- Highly private and secured
- Control Oriented.

Disadvantages:

- Poor scalability
- Costly Pricing
- Restriction

Community Cloud;

- It is a equally shared model between the organizations that belongs to a specific community such as banks, government organizations, or commercial enterprises.
- Community members usually share related issues of privacy, performance, and security. This type of deployment model of cloud computing is managed by a third-party vendor.

Hybrid Cloud;

- This model incorporates the best of both private and public clouds, but each can remain as separate units.
- This deployment of cloud computing model, the internal, or external providers can provide resources.
- A hybrid cloud is ideal for scalability, flexibility, and security.
- An organization who uses the private cloud to secure their data and interacts with its customers using the public cloud.

Advantages of Hybrid Cloud Computing are:

- Flexibility
- Secured
- Cost Effective

- Rich Scalability.

Disadvantages of Hybrid Cloud are:

- Multifaceted networking problem
- Organization's security Agreement

Q 3 part a;

Roles and Boundaries in cloud;

- Cloud Provider
- Cloud Consumer
- Cloud Service Owner
- Cloud resource administrator
- Organizational Boundary
- Trust Boundary

Cloud Provider;

- The association that affords cloud-based IT resources is the cloud supplier.
- The cloud provider is advance tasked with any necessary organization and managerial responsibilities to confirm the on-going process of the whole cloud organization.
- Cloud providers usually own the IT capitals that are complete accessible for agreement by cloud users; but, some cloud providers also “resell” IT resources rented from further cloud providers.

Cloud Consumer;

- A cloud consumer is an association that has a proper agreement or procedure with a cloud provider to use IT resources complete accessible by the cloud provider.
- Cloud consumer uses a cloud service consumer to admittance a cloud service.
- Administrations or humans displayed slightly retrieving cloud-based IT resources are careful cloud consumers.
- A cloud consumer interrelates with a cloud facility from a cloud provider.
- The cloud service consumer is being used to contact the cloud service.

Cloud Service Owner;

- The person or association that officially keeps a cloud service is called a cloud service owner.
- A cloud provider develops a cloud service owner if it arranges its own cloud service, characteristically for other cloud consumers to use.

Cloud resource administrator;

- A cloud resource administrator is the person or association answerable for managing a cloud-based IT resource.
- A cloud resource administrator can be with a cloud customer association and manage distantly reachable IT resources that feel right to the cloud user.
- Cloud resource administrator can be the cloud customer or cloud supplier of the cloud inside which the cloud service exist in.
- A cloud resource administrator can be with a cloud provider association for which it can manage the cloud provider's inside and outside accessible IT resources.

Organizational Boundary;

- An organizational boundary signifies the physical border that environs a usual of IT resources that are kept and ruled by an association.
- Organizational boundaries of a cloud user (left), and a cloud provider (right), symbolized by a broken line representation.

Trust Boundary;

- A trust boundary is a reasonable boundary that characteristically distances outside physical boundaries to denote the magnitude to which IT resources are reliable.
- A comprehensive trust boundary includes the structural boundaries of the cloud supplier and the cloud user.
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Q 3 part b;

Cloud Risk and Challenges;

- Security & Privacy
- Interoperability & Portability
- Reliable & Flexible
- Cost
- Downtime
- Lack of Resources
- Management of Multi-cloud Environment

Security & Privacy;

- The information store in the cloud need to safe and provide full privacy.
- The consumers trust on the cloud supplier so greatly.
- This means that the cloud supplier would take required security agencies to safe the information of the consumers.

- Safeties are also the restraint of the consumer as they would deliver a strong password, must not share the password with anyone, and repeatedly change the password when we did.
- If the information is external the firewall there may be approximately problems which can reject by the cloud supplier.
- Hacking and malware are also one of the main problems as it can affect various consumers. Hacking can lead to information loss; disturb the encoded file organization and several other problems.

Interoperability & Portability;

- The client must be providing with the facilities of movement in and out of the cloud.
- There must be no connection period as it can make interference for the clients.
- The cloud must have the capability to offer services on the properties.
- One of the Cloud experiments is distant access which can reduce by the cloud supplier so that the client can contact the cloud from everywhere safety.

Reliable & Flexible;

- Reliability and flexibility are also one of the challenges of cloud consumers and it can reduce in a method that the information delivered to the cloud should not outflow and the host should offer the consistency to the clients.
- To reduce this challenge the facilities delivered by the third party would be supervised and administration would be complete on presentation, strength and professional addiction.

Cost;

- Cloud computing itself is inexpensive, but change the platform affording to the company's requirements can be costly.
- Moreover, the cost of moving the information to public clouds can show to be a problematic for short-lived and small-scale projects.
- Companies can save some money on system repairs, organization, and achievements.
- But they also have to spend in extra bandwidth, and the nonappearance of routine control in an extremely accessible computing platform can raise costs.

Downtime;

- Downtime is a important deficiency of cloud technology.
- No vendor can promise a platform that is allowed likely downtime.
- Cloud technology creates small companies dependent on their connectivity, so companies with an unreliable internet connection possibly want to consider double before approving cloud computing.

Lack of Resources;

- Lack of resources and knowledge is also one of the major challenges handled by the cloud commerce and many corporations are hopeful to stun this challenge by employing more staffs which are more knowledgeable.
- These employees will not simply help to reduce the challenges of the establishments but also they will train obtainable staff to advantage the corporation.
- Today many IT employees are occupied to boost the cloud computing capability and CEO of the corporation is discovery it problematic as the employees are not much experienced.
- It considers that employees with information of the latest improvement and the skills connected to it will become more valued in business.

Management of Multi-cloud Environment;

- Corporations currently do not use a single cloud in its place they are using various clouds.
- On a regular corporation are using 4.8 different public and private clouds due to which their organization is stuck.
- When a corporation customs multi-cloud there are so many difficulties handled by the IT team.
- This Cloud challenge can reduce by training employees, consumption of proper tools, and doing investigation.