Assignment 1 :- Cloud Computing – CS 623-01

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Section A:-

Consider the example we had at the beginning of the course (Website with increase and decrease volume of users). In this problem statement please consider the cloud characteristics we discussed in this lecture and explain how cloud can help us reduce the costs and risks we have in compare with physical resources. Please separate each characteristic and explain your idea.

Solution :- Suppose we have a website with 500 users where we have our own data center so we buy a server and experts in OS, DB and network where we can service 500 users with no issue. After a year it increases to 5000 so we need more users and after 2 years there are 20,000 users so we have to pay for more staff and hardware. When COVID-19 shows up users drop to 3000. So what are the characteristics of cloud computing that can be in-corporated in order to overcome this issue. So, in order to overcome this issue we will be using virtual resources such as database, hardware and software which would take away the demand of scaling up and down of the physical infrastructure that we have done. Below are the few characteristics that if used would help us to cover up for the above problems:

1. **On- demand service:-** Based on the above example given the resources can be provided by the cloud provider virtually whenever needed. It is an automated process we just need to give the details to the provider without even physically meeting with them.
2. **Broad network access :- a.** The resources that are provided by the vendor can be accessed over the internet virtually.
   b. Also the services provided by them are not dependent on platform or are varying from platform to platform i.e. we can access these services from different laptops, smartphones, tablets, workstation, etc which can accessed virtually all over the globe.
3. **Resource Pooling:- a.** The resources and the services which are provided by the vendors of cloud providers are versatile enough to provide services to multiple users at a time.
   b. It allows multiple users to be provided services by same set of infrastructure that is being setup by the cloud vendors.
4. **Rapid Elasticity:- a.** As mentioned in the above example initially there were 500 users then after a year it was 5000 and 2 years it was 20000 and so on. So, with the help of cloud services it is very easy to scale up the resources according to the number of users increasing.

b. But, on the other hand as mentioned in above example the users suddenly decreased during the pandemic which reduces the demand to use resources so the scaling down of resources was done as there was no need for those additional resources.

5. **Measured Service:-** a. The cloud services provided by vendors charge you only for the number of resources and services that we use. So, suppose if the resource demand falls we can request them to reduce resources and pay less as we have reduced the resources and pay more if the demand for resources is more.
   b. So, as per above example the website owner pays more or less depending on the traffic that he has on his website.

6. **Performance:-** Since that resources that is provided can be scaled up and down we get high level of performance expectancy based on the workload that we face.

7. **Reduced Cost:-** a. As mentioned in above example in order to manage the application we have to purchase the hardware the team for the smooth functioning of the application and if the demand of users increases we have to keep purchasing these resources continuously.
   b. But, with the cloud vendors being for us we don't have to do these expensive setup which reduces the cost upto great extent.

8. **Outsourced Management:-** With cloud services we can give our requirements of resources to vendors and they would outsource all the resources. As, mentioned in above example we don't have to do all the expensive setup.

9. **Reliability:-** The application is maintained by the set of professionals who are experts in those fields. So, if there is an issue with the maintenance of the application it can be taken care by cloud vendors.

10. **Multi Tenancy:-** This feature allows the any number of users to the use the services which is deployed on the website. This can be handled virtually by making a set of virtual resources or by using organic multi- tenacy.

> These are the characteristics of the cloud services which would enable a new business owner to take care of all the operations that are needed to handle his business on the backend.

Section B:-

Please name at least 5 service for each cloud service model (SaaS, PaaS, IaaS) and describe each service in a paragraph.

Solution :- 1. <u>**SaaS**</u> :-

a. It stands for Software as a Service where cloud service provider deploys the application in such a way that it can be accessed via internet.

b. Here, licensed software is placed on the cloud centrally.

c. This service reduces the effort of setting the complex software and hardware locally.

Examples of SaaS services provider :-

1. **Salesforce** :- Salesforce has a tool named as CRM (Customer Relationship Management) which is used for maintain the records of the customer for a small, large or medium scale organization.
2. **Netflix** :- It is a company which is licensed to sell videos. Here, the customer is provided with video access after taking the premium subscription which enables the customer to access videos on demand.
3. **Zoom** :- It is known to provide live video conferencing services to the customer remotely.
4. **Gmail** :- It provides customer with online email services which enables to send, receive messages, videos and pictures on demand. It takes the load off the customer to not maintain their own email servers.
5. **SAP**:- It is somewhat similar to Salesforce which is known to provide CRM tools, along with expenses management and field services management.

2. **PaaS** :-

a. Platform as a service, a cloud computing service model where a software and hardware services are provided by the vendor over the internet.

b. Mainly this service is used for development purpose. This reduces the effort of physically setting up the hardware and software locally.

c. Based on the requirement of the business with the help of this service we can up or down scale the resources as on demand.

d. This service is basically used when multiple people or developers are working on same business model which helps to reduce redundancy as well as maintains the integrity of the data.

Examples of PaaS services provider :-

1. **Amazon Web Services – Elastic Beanstalk :-** It is used for deploying application which can scaled in the future if the demand rises. It provides databases as well as the software which makes the life of the developer easy with software and hardware already on place.
2. **Microsoft Azure :-** It is similar to AWS – Elastic Beanstalk developed by Microsoft which is known to provide services such as database and software to deploy the application as on demand required by business and developers.
3. **Google App Engine :-** Another service provider similar to above 2 providers. It is known to provide different databases services as well as software for hosting the applications.
4. **IBM – Bluemix :-** Service provider based on Cloud Foundry. Known for providing heavy security and control over the hardware and software components provided to the customer.
5. **VmWare – Pivotal CF :-** This service provider provides the user with the virtual system where the user can directly work on it from anywhere just by connecting the virtual setup. Which makes the system as well as the data secure with the business and the user cannot move data outside the virtual environment.

3. IaaS:-

a. Infrastucture as a Service it is known to provide services virtually computing resources over the internet.

b. It has the features of SaaS and PaaS together where the user or the business can scale the up or down on the demand.

c. It helps to avoid physical servers and infrastructure where every resource is provided as a distinct component of a service.

d. Here the vendor or provider takes care of setting up the physical setup where as the user installs, configures and manages software which includes application, software and OS.

e. As it is heavily relying on cloud servers the performance is very good as compared to other services of cloud computing.

Examples of IaaS services provider :-

1. **DigitalOcean :-** It is a cloud service provider which helps to deploy, scale applications and provide resources required for hosting that run run parallely or altogether on many other devices.
2. **Google Computer Engine: -** It is a IaaS component of Google Cloud Platform running on Google Search Engine , Gmail, Youtube and other Google services. It also enables the user to provide virtual machines if needed.
3. **Linode :-** It is known to provide an environment suitable for the users or developers to deploy their application with the help of Linux Virtual Machine.
4. **Vultr:-** It is one of the top IaaS cloud service provider. It is known to provide 100% SSD Storage, low latency, user friendly interface and deployment features at very low costs.
5. **Alibaba Cloud :-** It is a Chinese IaaS provider known to provide reliable service Infrastructure in order to provide the cloud services. It mainly focuses on Data Capacity Scaling, log monitoring and Backups and recovery in case of natural or man made disasters.