CC ASSIGNMENT - 1

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CLOUD COMPUTING

Assignment: 1

Question 1:

Describe various computing environments and analyze advantages and disadvantages for each of them.

A: Different types of computing environments are:

i) Personal computing: In this type of computing environment, there is a stand-alone machine i.e., there is a single computer. This type of computing environment is generally used by single users to run tasks at home or offices because all the system processes are available on the computer and the programs are executed there themselves. Machines such as laptops, mobiles, printers, etc are a part of the Personal Computing Environment which we use in our day to day lives.

Advantages :

- Single user access
- Portable
- Upgradeability
- Privacy and Security
- Cost-effective

Disadvantages :

- Less Computing Power.
- Wastage of equipment and data.
- No distribution or sharing.

ii) Time Sharing Computing:

In this type of computing environment, resources are shared among multiple users simultaneously on basis of time slots. Every single user is provided with a time slot so that the processor switches rapidly among the users according to it. For example, the first user uses the resources under the first time slot and so on. Thus, each user believes that they are the only ones using the system. Unix, IOS, Linux OS are some of the examples of this time-sharing computing environment.

Advantages :

- Reduces CPU Idle time.
- Avoids Duplication of software.
- Quick Response: Since all the tasks are given a particular time slot.
- Less Switching time.

Disadvantages :

- Reliability.
- Security.
- Integrity.
- Problems in Data communications.

iii) Client-Server Computing:

In this type of computing environment, the client requests resource,s and the server provides that respective resource. In this, two machines are involved i.e., client machine and server machine. A single client can connect to only one server at a time but a single server can have multiple clients connected to it.

Advantages :

- The server need not be located physically close to the clients and the data can be accessed efficiently.
- High Security: Since the data resides on a particular server.
- Scalability: Can perform horizontal or vertical scaling as per use.
- Centralized control.

Disadvantages :

- Maintenance timeouts.
- If the server fails for any reason, then none of the requests of the clients can be fulfilled.
- Single point of failure: As the data is stored on a single server if it fails then the whole application shuts down.
- Traffic Congestion.

iv) Distributed Computing:

In this type of computing environment, multiple nodes are connected together using a network but physically they are separated. Each of these nodes contains a small part of the distributed operating system software. Here, the communication happens via a network where different nodes work on different sub-goals of a larger goal. This means that various nodes work simultaneously on various programs of an application.

Advantages :

- Low latency: Since the nodes are distributed over large geographical areas it's easy for users to access the resources in a faster way
- Scalability: More nodes can easily be added to the distributed system as per requirement.
- Efficiency
- Fault-tolerant: Even if one node goes down there are other nodes to backup the services.

Disadvantages :

- Complexity: The database connected to the distributed systems is quite complicated and difficult to handle as compared to a single user system.
- Adequate Security.
- Overloading may occur.
- Loss of Data: The data can be lost in the network while moving from one node to another.

v) Grid Computing:

In this type of computing environment, a set of computer nodes running in a cluster jointly perform a given task by applying the resources of multiple nodes. Here, the nodes work on a single goal as an entity. Also, multiple computers from different locations work on a single problem.

Advantages :

- Better use of existing hardware.
- Easy collaboration.
- Inherently scalable.
- Fault-tolerant.
- Anonymity.

Disadvantages :

- Higher Initial cost.
- Non-interactive job submission.
- Standards are still evolving.
- Complex

vi) Cloud Computing:

In this type of computing environment, on-demand availability of computer system resources like processing and storage are availed. Here, resources are provided to users by cloud vendors as per the pay so it's a pay-per-use model. Resources are pooled here instead of individual access.

Advantages :

- Data Security
- Low maintenance cost
- Mobility
- Reliability
- High Speed
- Improved collaboration
- Accessibility

Disadvantages :

- Limited control: The service provider can limit the users over access provides by the infrastructure.
- Vendor lock-in: Transfering their services from one vendor to another is difficult as different vendors provide different platforms.

Question 2:

Is Cloud Computing the best choice always? Justify your answer in detail.

Ans: I would say that **"Cloud Computing is always not the best choice"**. Here's my explanation.

- ☐ To justify my answer, there are a lot of things to consider because one has to use a service based on their requirements and usage. We have different layers of computing i.e., cloud layer, fog layer, and edge layer.

- ☐ Each layer has its own advantages and disadvantages but we are interested in where to use such layers and at what time.

- ☐ We may use them for several purposes like increasing the responsiveness, improving security by a bit, reducing the cost, the amount of data being generated at the local view, global view, etc. I will give the same example as we discussed in the class for better understanding.

- In the case of self-driving cars, one has to not use cloud computing instead use edge computing because of mainly the response time. Consider a scenario where a person is traveling in a self-driving car.

- Here, the vehicles on the road may suddenly come in front of the vehicle and the car has to apply breaks as soon as possible to prevent the vehicle from undergoing an accident.

- If in such case, if we use cloud computing then first the car sends the data captured to the cloud via the internet(which takes time due to some network lag, etc) and when by the time cloud computes and sends it back, the person might be involved in an accident and be in a critical condition.

- Thus, here time plays a crucial role. Therefore, in such a scenario decreasing the time to compute is mostly required and therefore edge computing is preferred instead of cloud computing.

- Another case would be where we extensively use IoT devices and totally depend on them. These IoT devices only need to have the local view/sense of the locality in which these IoT devices are installed.

- In such cases where to and fro communication time required is less and also the bandwidth required is also less.

- Here, instead of cloud computing, fog computing's distributed approach addresses the needs of IoT, as there is an immense amount of data from the smart sensors that need to be computed instead of using edge computing with less computation power.

- It would be really time-consuming and costly to send data to the cloud for processing and analysis for such generated IoT devices. Therefore, Fog computing reduces the bandwidth needed and reduces the back and forth communication between sensors and the cloud, which will improve its performance and response time.

- ☐ Thus, this was a very detailed explanation of why the use of cloud computing always is not good.

Question 3:

Explain which computational paradigm - cloud, edge, or fog - is more suitable for Automated Museum Tour Guide. Describe your answer in detail.

Ans :

- ➢ **Fog Computing** is more suitable for an Automated Museum tour guide. It's more suitable because these automated robots should have a global view of the museum and interact well with the museum environment.

- ➢ Otherwise, communication with other robots as well visitors wouldn't work properly. Let's say if the automated museum tour guide uses edge computing, then robots will only have a local view of the environment.

- ➢ Then, if in future few changes are to be made like if arts in the museum are to change to different places or the order of the exhibit is to be modified or new arts are to be added to the museum, then

the automated system will not function as designed and we have to reprogram the device again.

- Since edge computing lacks a global view, it is better not to use edge computing in this scenario and instead use Fog computing. We don't use cloud computing here because of mainly response time, bandwidth, and high network traffic.

- If Fog computing is used here, then the complex computations can also be done very efficiently and fastly and the changes done in the program are reflected quickly so that all the devices connected to the museum level server can perform the changes.

- Also, fog-based applications are easier to deploy. Fog computing processes selected data locally instead of sending them to the cloud for processing.

- Fog computing also reduces the latency which helps to assist the people in real-time which can, in turn, save network bandwidth and leads to lower operational costs.

- Thus, I would like to conclude that Fog Computing is more suitable for an Automated Museum tour guide.

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