Roll No. _____ Section _____

National University of Computer and Emerging Sciences, Lahore Campus

Course:	Introduction to Cloud Computing	Course Code:	CS-499
Program:	BS -Computer Science	Semester:	Fall 2017
Duration:	60 Minutes	Total Marks:	40
Paper Date:	02-Nov-17	Weight	15%
Section:	N/A	Page(s):	1
Exam:	Mid 2	Reg. No.	

Instruction/Notes: -Please answer all the questions on the answer book provided.

1-Write the Map Reduce pseudo code which would count number of words in a document? Explain how Map Reduce works.

Marks 10

ANS:

The problem of counting the number of occurrences

of each word in a large collection of documents.

The user would write code similar to the following

pseudo-code:

```
map(String key, String value):
    // key: document name
    // value: document contents
    for each word w in value:
    EmitIntermediate(w, "1");
reduce(String key, Iterator values):
    // key: a word
    // values: a list of counts
    int result = 0;
    for each v in values:
        result += ParseInt(v);
    Emit(AsString(result));
```

Roll No. _____ Section _____

2-Which Cloud Mechanism can logically combine Cloud-based IT resources that are geographically diverse to improve their allocation and use? State the Mechanism name and explain how it works.

Marks 10

Resource Cluster

Cloud-based IT resources that are geographically diverse can be logically combined into groups to

improve their allocation and use. The resource cluster mechanism (Figure 8.30) is used to group

multiple IT resource instances so that they can be operated as a single IT resource. This increases the

combined computing capacity, load balancing, and availability of the clustered IT resources

Resource cluster architectures rely on high-speed dedicated network connections, or cluster nodes,

between IT resource instances to communicate about workload distribution, task scheduling, data

sharing, and system synchronization. A cluster management platform that is running as distributed

middleware in all of the cluster nodes is usually responsible for these activities. This platform

implements a coordination function that allows distributed IT resources to appear as one IT resource,

and also executes IT resources inside the cluster.

Common resource cluster types include:

• Server Cluster – Physical or virtual servers are clustered to increase performance and

availability. Hypervisors running on different physical servers can be configured to share

virtual server execution state (such as memory pages and processor register state) in order to

establish clustered virtual servers. In such configurations, which usually require physical

servers to have access to shared storage, virtual servers are able to live-migrate from one to

another. In this process, the virtualization platform suspends the execution of a given virtual

server at one physical server and resumes it on another physical server. The process is

transparent to the virtual server operating system and can be used to increase scalability by

live-migrating a virtual server that is running at an overloaded physical server to another

physical server that has suitable capacity.

• Database Cluster – Designed to improve data availability, this high-availability resource

cluster has a synchronization feature that maintains the consistency of data being stored at

different storage devices used in the cluster. The redundant capacity is usually based on an

active-active or active-passive failover system committed to maintaining the synchronization

conditions.

• Large Dataset Cluster – Data partitioning and distribution is implemented so that the target

datasets can be efficiently partitioned without compromising data integrity or computing

accuracy. Each cluster node processes workloads without communicating with other nodes as

much as in other cluster types.

Many resource clusters require cluster nodes to have almost identical computing capacity and

characteristics in order to simplify the design of and maintain consistency within the resource cluster

architecture. The cluster nodes in high-availability cluster architectures need to access and share

common storage IT resources. This can require two layers of communication between the nodes—one

for accessing the storage device and another to execute IT resource orchestration (Figure 8.31). Some

resource clusters are designed with more loosely coupled IT resources that only require the network

layer

3-How would you manage billing of customers in a cloud environment. Please explain the different components used and draw a diagram to support the explanation.

Marks 10

The billing management system mechanism is dedicated to the collection and processing of usage

data as it pertains to cloud provider accounting and cloud consumer billing. Specifically, the billing

management system relies on pay-per-use monitors to gather runtime usage data that is stored in a

repository that the system components then draw from for billing, reporting, and invoicing purposes

The billing management system allows for the definition of different pricing policies, as well as

custom pricing models on a per cloud consumer and/or per IT resource basis. Pricing models can

vary from the traditional pay-per-use models, to flat-rate or pay-per-allocation modes, or

combinations thereof.

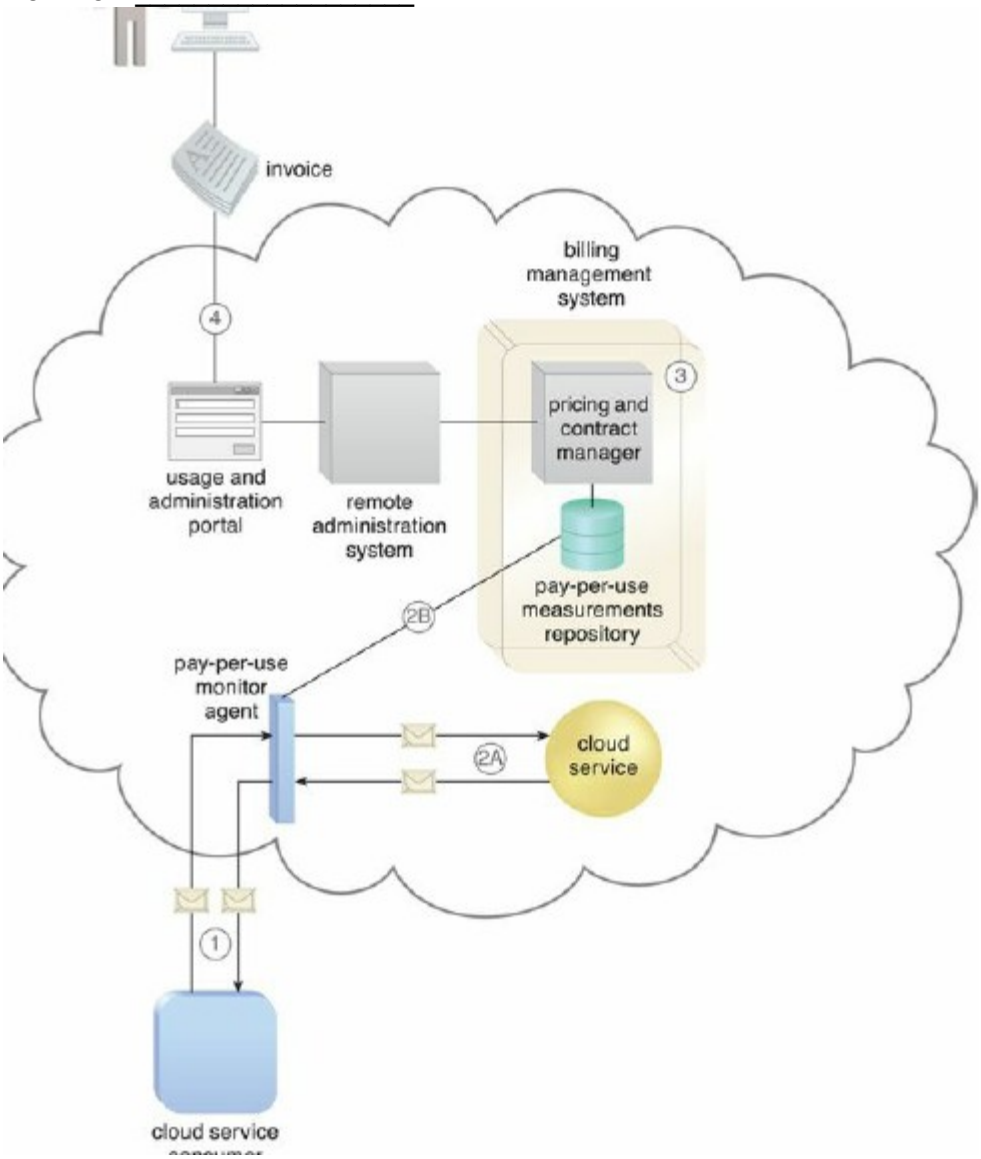
Billing arrangements be based on pre-usage and post-usage payments. The latter type can include predefined

limits or it can be set up (with the mutual agreement of the cloud consumer) to allow for

unlimited usage (and, consequently, no limit on subsequent billing). When limits are established, they

are usually in the form of usage quotas. When quotas are exceeded, the billing management system can

block further usage requests by cloud consumers.



4- A maintenance update has to be done on the servers providing your customers a cloud service. You cannot scale in or out on redundant implementations. Given this constraint, explain which architecture can you use to give your customers uninterrupted services. Please draw diagrams to explain your solution.

Marks 10

Non-Disruptive Service Relocation Architecture

The *non-disruptive service relocation architecture* establishes a system by which a predefined event

triggers the duplication or migration of a cloud service implementation at runtime, thereby avoiding

any disruption. Instead of scaling cloud services in or out with redundant implementations, cloud

service activity can be temporarily diverted to another hosting environment at runtime by adding a

duplicate implementation onto a new host. Similarly, cloud service consumer requests can be

temporarily redirected to a duplicate implementation when the original implementation needs to

undergo a maintenance outage. The relocation of the cloud service implementation and any cloud

service activity can also be permanent to accommodate cloud service migrations to new physical

server hosts.

A key aspect of the underlying architecture is that the new cloud service implementation is guaranteed

to be successfully receiving and responding to cloud service consumer requests *before* the original

cloud service implementation is deactivated or removed. A common approach is for live VM

migration to move the entire virtual server instance that is hosting the cloud service. The automated

scaling listener and/or load balancer mechanisms can be used to trigger a temporary redirection of

cloud service consumer requests, in response to scaling and workload distribution requirements.

Either mechanism can contact the VIM to initiate the live VM migration process