

GANPAT UNIVERSITY

B. TECH. CSE SEM- VII (CBA) REGULAR/REMEDIAL EXAMINATION NOV-DEC 2022
2CSE710 CLOUD COMPUTING ESSENTIALS

MAX. TIME: 3 HRS

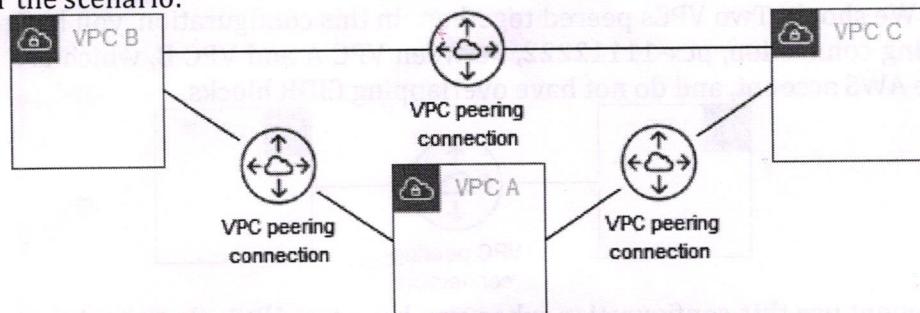
TOTAL MARKS: 60

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.

- (2) Figures on right indicate marks.
 - (3) Assume suitable data if necessary.
 - (4) Standard terms and notation are used.

SECTION - I

- | | | | |
|-----|-----|---|------|
| Q-1 | (1) | Find odd one out in case of benefits of private clouds. | [01] |
| | | A. Increased infrastructural capacity to handle large compute and storage demands. B. On-demand services using self-service user interfaces C. Efficient resource allocation based on user needs. Dec D. Decreased visibility into resources across the infrastructure. | |
| | | Ans: Option - D | |
| (2) | | A situation where the cost of switching to a different cloud vendor is so high that the customer is essentially stuck with the original cloud vendor is referred as: | [01] |
| | | A. Vendor SLA B. Vendor Lock-Out C. Vendor Lock-In D. Cloud Burst-In | |
| | | Ans: Option - C | |
| (3) | | Formula from Cloud Economics used to calculate all costs and benefits related to a cloud computing project is referred as: | [01] |
| | | A. Total Cost of Ownership B. Total Ownership Cost (TOC) C. Cloud Vendor Cost (CVO) D. Total Ownership Value (TOV) | |
| | | Ans: Option - A | |
| (4) | | How we can provide data protection against accidental or malicious object update, overwrite, or deletion on data over the cloud? | [01] |
| | | A. Block Versioning B. Storage Versioning C. Meta Versioning D. Object Snapshots | |
| | | Ans: Option - B | |
| (5) | | Why you should use Virtual Private Cloud over public cloud? | [01] |
| | | Ans: Amazon VPC enables you to build a virtual network in the AWS cloud - no VPNs, hardware, or physical datacenters required. You can define your own network space and control how your network, and the Amazon EC2 resources inside your network, is exposed to the Internet. | |
| (6) | | When owning your resources, you may pay a penalty whenever your resources do not match the instantaneous demand. Why? | [01] |
| | | Ans: Under Provisioning and Over Provisioning causes the penalty. If demand is flat then penalty = ZERO, If linear = Periodic Provisioning. | |
| (7) | | Refer the scenario: | [01] |



Select use case from below option that is best suitable for VPC peering.

- A. File Sharing Server B. CHAT Server C. Email Server D. NTP Server

Ans: Option - A

- (8) Is it possible to have platform that enables teams to use Terraform together, either on-demand or in response to various events. [01]

Ans: Yes, using Terraform Cloud

- (9) Can Terraform be used for on-prem infrastructure? Suggest any one use case. [01]

Ans: Yes, Launch game on container on local machine

- (10) It is said that - "Site Reliability begins with the idea that availability is a prerequisite for success". Why? [01]

Ans: Because, an unavailable system can't perform its function and will fail by default.

- Q-2 (A) Consider that the peak computing demand for an organization is 100 units. The demand as a function of time can be expressed as $50(1 + e^{-t})$. Baseline (owned) unit cost is 120 and cloud unit cost is 200. In this situation is cloud cheaper than owning for a period of 100-time units? [05]

Ans:

Total Baseline Cost :

$$B_T = P \times B \times T = 100 \times 120 \times 100 = 1200000$$

Total Cloud Cost :

$$C_T = \int_0^{100} C \times D(t) dt = \int_0^{100} 200 \times 50(1 + e^{-t}) dt$$

$$= 10000 \left[t \right]_0^{100} + \left[-e^{-t} \right]_0^{100}$$

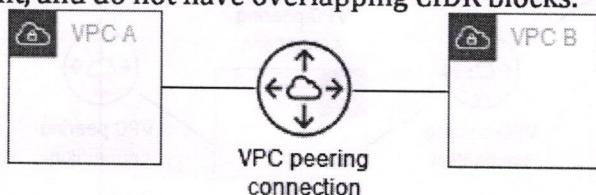
$$\approx 10,10000$$

$$\text{Utility premium} = \frac{C_T}{B_T} = \frac{1010000}{1200000} = 0.84 < 1$$

(Cloud will be Cheaper.)

- Q-2 (B) Your company has a Virtual Private Cloud for the finance department, and another VPC for the accounting department. The finance department requires access to all resources that are in the accounting department, and the accounting department requires access to all resources in the finance department. Design the solution with step-by-step process. Justify your network design. [05]

Ans: We should Two VPCs peered together. In this configuration, you have a VPC peering connection, ppx-11112222, between VPC A and VPC B, which are in the same AWS account, and do not have overlapping CIDR blocks.



You might use this configuration when you have two VPCs that require access to

each other's resources. For example, you set up VPC A for your accounting records and VPC B for your financial records, and these each VPC must be able to access resources from the other VPC without restriction.

Single VPC CIDR

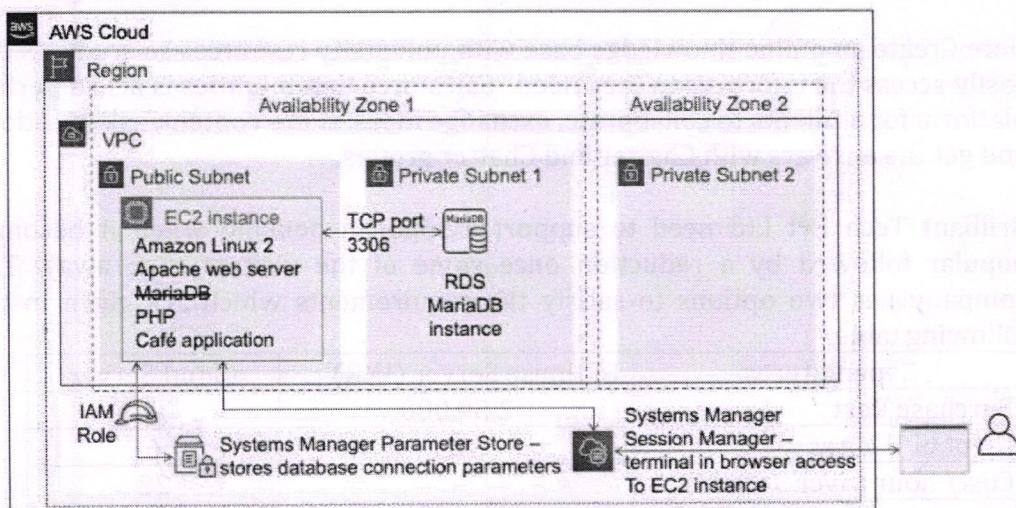
Update the route table for each VPC with a route that sends traffic for the CIDR block of the peer VPC to the VPC peering connection.

| Route table | Destination | Target |
|-------------|-------------|--------------|
| VPC A | VPC A CIDR | Local |
| | VPC B CIDR | pcx-11112222 |
| VPC B | VPC B CIDR | Local |
| | VPC A CIDR | pcx-11112222 |

OR

- Q-2 (B) As a Native Cloud Application Developer, how can you protect your database server being accessible from outside of the world? Design the solution and provide your set of recommendations to justify the design proposed. [05]

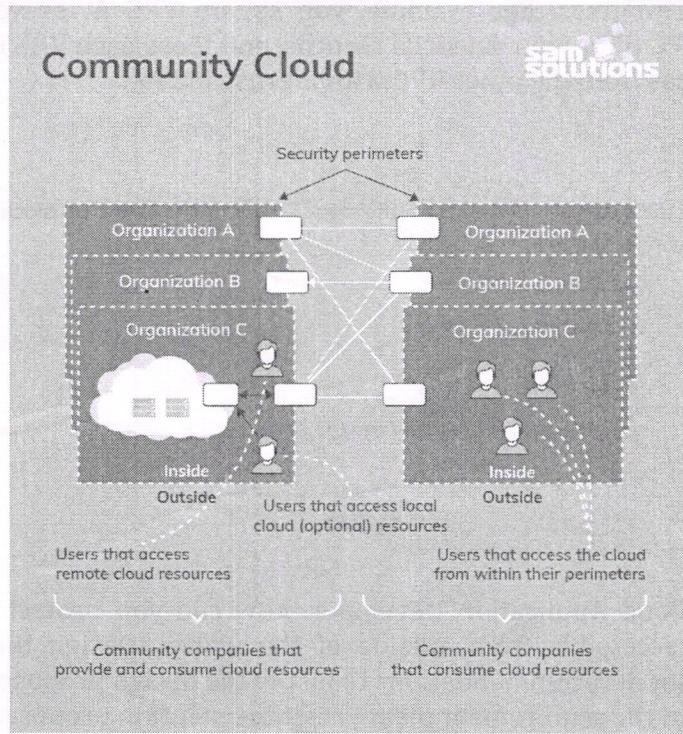
Ans: Looking to the requirement please refer the solution propose.



- Q-3 Attempt ANY TWO questions from following questions. [10]

- (A) Consider higher education scenario. StarBot University is trying to build cloud native App and adapt Cloud environment for their Student Information System. Where they can automate a lot of essential processes like student admissions, payments, scheduling, and registration for courses, programmes and exams. Being Cloud Expert, you have been asked to propose proper cloud deployment model. Provide your suggestions with proper justification.

Ans: As per our opinion we may have Private, Public, Hybrid , Multi cloud , community cloud with us to make a choice.



Here Create an online Knowledge base with university resources so students can easily access the information they need. Salesforce Communities is also a perfect platform for students to collaborate, exchange ideas, share content, ask questions and get the answers with Chatter and Chatter groups.

- (B) Brilliant Tech Pvt Ltd need to support a spike in demand when it becomes popular followed by a reduction once some of the visitors turn away. The company has two options to satisfy the requirements which are given in the following table:

| Expenditures | In House Server (INR) | Cloud Server |
|-----------------------------|-----------------------|--------------|
| Purchase Cost | 2,50,000 | - |
| No of CPU cores | 8 | 6 |
| Cost/ hour (over 3 years) | - | 22 |
| Efficiency | 40% | 75% |
| Power & Cooling (cost/hour) | 15 | - |
| Management Cost (cost/hour) | 4 | 2 |

- Calculate the price of a core-hour on in-house server and cloud server.
- Find the cost/effective-hour for both the options.
- Calculate the ratio of the total cost/effective-hour for in house to cloud management.
- If the efficiency of in-house server is increased to 85%, which deployment will have now better total cost/effective-hour?

Ans:

Q:-a (B) NM Tech Solutions Pvt Ltd - example.

- Total cost/hour (Inhouse) = $\frac{2,50,000}{3 \times 24 \times 365} = 9.51 \text{ INR}$
- Total cost/hour (Cloud) = 22 INR
- core-hour (Inhouse) = $9.51/8 = 1.188 \text{ INR}$
core-hour (Cloud) = $22/6 = 3.66 \text{ INR}$
- cost per effective hour (Inhouse) = $\frac{9.51}{80/100} = 23.75 \text{ INR}$
- cost per effective hour (Cloud) = $\frac{22}{75/100} = 29.33 \text{ INR}$
- Total cost per effective hour (Inhouse) = $23.75 + 15 + 4 = 42.75$
Total cost per effective hour (Cloud) = $29.33 + 2 = 31.33 \text{ INR}$.

so; Here cloud is cheaper.

Let's consider increased efficiency of Inhouse = 85%

$$\text{Total cost per effective hour (Inhouse)} = \left(\frac{9.51}{85/100} \right) + 15 + 4$$

$$\text{Total cost per effective hour (Inhouse)} = 11.18 + 19 = 30.18$$

Here, If we can increase efficiency of Inhouse up to 85%. then On-prem is cheaper as compare to cloud.

- (C) Write the Terraform script to create and launch Virtual Machine with following specifications: Follow standard coding practice.

TAG = ICT-LINUX-SERVER1, Environment = "DEV", OS = "UBUNTU", No of VCPU = 01 & RAM = 01 GB & Allowed Port for transport = 80

Ans:

```
variable "awsprops" {
  type = "map"
  default = {
    region = "us-east-1"
    vpc = "vpc-5234832d"
    ami = "ami-0c1bea58988a989155"
    itype = "t2.micro"
    subnet = "subnet-81896c8e"
    publicip = true
    keyname = "myseckey"
    secgroupname = "IAC-Sec-Group"
  }
}
```

```
provider "aws" {
  region = lookup(var.awsprops, "region")
```

}

```

resource "aws_security_group" "project-iac-sg" {
  name = lookup(var.awsprops, "secgroupname")
  description = lookup(var.awsprops, "secgroupname")
  vpc_id = lookup(var.awsprops, "vpc")

  // To Allow SSH Transport
  ingress {
    from_port = 22
    protocol = "tcp"
    to_port = 22
    cidr_blocks = ["0.0.0.0/0"]
  }

  // To Allow Port 80 Transport
  ingress {
    from_port = 80
    protocol = ""
    to_port = 80
    cidr_blocks = ["0.0.0.0/0"]
  }

  egress {
    from_port   = 0
    to_port     = 0
    protocol    = "-1"
    cidr_blocks = ["0.0.0.0/0"]
  }
}

resource "aws_instance" "project-iac" {
  ami = lookup(var.awsprops, "ami")
  instance_type = lookup(var.awsprops, "itype")
  subnet_id = lookup(var.awsprops, "subnet") #FFXsubnet2
  associate_public_ip_address = lookup(var.awsprops, "publicip")
  key_name = lookup(var.awsprops, "keyname")

  vpc_security_group_ids = [
    aws_security_group.project-iac-sg.id
  ]
  root_block_device {
    delete_on_termination = true
    iops = 150
    volume_size = 50
    volume_type = "gp2"
  }

  tags = {
    Name ="SERVER01"
    Environment = "DEV"
    OS = "UBUNTU"
    Managed = "IAC"
  }
}

```

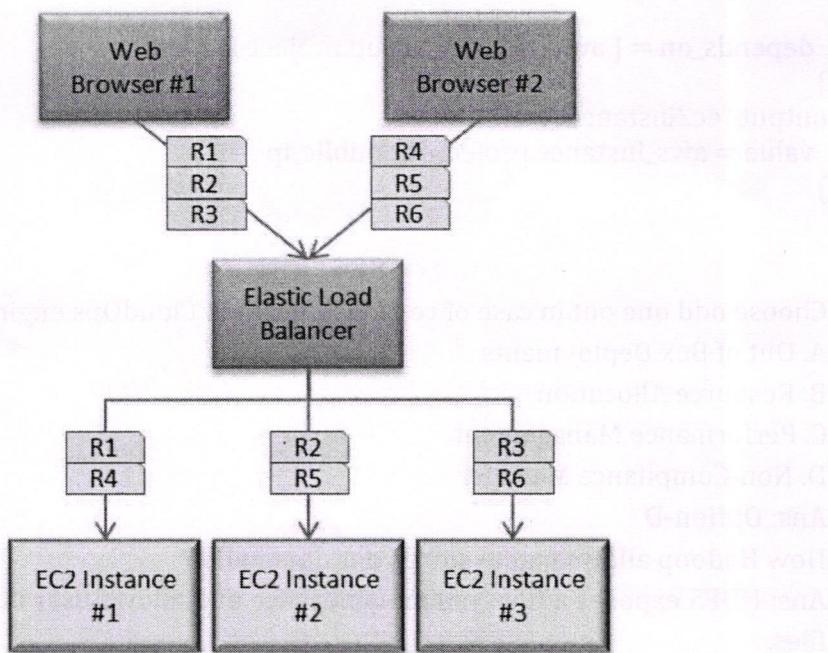
```

depends_on = [ aws_security_group.project-iac-sg ]
}
output "ec2instance" {
  value = aws_instance.project-iac.public_ip
}

```

SECTION - II

- Q-4 (1) Choose odd one out in case of responsibilities of CloudOps engineer. [01]
- Out of Box Deployments
 - Resource Allocation
 - Performance Management
 - Non-Compliance Manager
- Ans: Option-D**
- (2) How Hadoop allows you to store your data in file? [01]
- Ans: HDFS exposes a file system namespace and allows user data to be stored in files.**
- (3) Choose odd one out in case of Cloud Migration technique. [01]
- Replace
 - Lift and Shift
 - Revisit
 - Refactor
- Ans: C**
- (4) Which node is the master node in Hadoop Distributed File System that manages the file system metadata. [01]
- Meta
 - Tag
 - Name
 - Data
- Ans: C – Name**
- (5) During the migration, it refers to re-architecting the application from the beginning up on a PaaS provider's platform. [01]
- Rebuild
 - Revise
 - Refactor
 - Rehost
- Ans: A**
- (6) Configuring Auto Scaling Group using Terraform, how to decide the number of Amazon EC2 instances that should be running in the group? [01]
- "complete_autoscaling_group_reserved_capacity"
 - "autoscaling_group_desired_capacity_complete"
 - "complete_autoscaling_group_desired_capacity"
 - "autoscaling_group_reserved_capacity_complete"
- Ans: Option-C**
- (7) Observe the below image and identify the type of load balancing algorithm used here. [01]



Ans: Round Robin Algorithm

- (8) In case of edge computing, which benefit is not included after implementation? [01]
 A. Low latency B. Bandwidth C. Security D. High Performance
- Ans: Option-D**
- (9) Modern tools for cloud health monitoring helps to get health report of: [01]
 A. Infrastructure B. Resources C. Applications D. All of these
- Ans: Option-D**
- (10) The purpose of edge computing is to bring what closer to where the data is created and action must happen. [01]
 A. DB Server B. API gateway C. Applications D. Cloud Service Provider

- Q-5 (A)** Consider an ecommerce system that receives a million requests every day to process payments. There may be several exceptions thrown during these requests such as:

Exception:1 "payment declined by a payment gateway."

Exception:2 "out of inventory"

Exception:3 "invalid address."

A developer wants to analyze last four days' logs to understand which exception is thrown how many times.

Input: one record of the log file

Assume that: the total no of mapper functions are 04 as shown below:

Mapper 1 -> <ExA,1>, <ExB,1>, <ExA,1>, <ExC,1>, <ExA,1>

Mapper 2 -> <ExB,1>, <ExB,1>, <ExA,1>, <ExA,1>

Mapper 3 -> <ExA,1>, <ExC,1>, <ExA,1>, <ExB,1>, <ExA,1>

Mapper 4 -> <ExB,1>, <ExC,1>, <ExC,1>, <ExA,1>

Demonstrate Combine, Partition & Reduce Stage using Map Reduce approach. Find out which exception is thrown more often than others and requires more attention by E Com App Developer?

Ans:

Combiner Stage

Combiner running on each mapper, So: the **input** to each Combiner 1 to 4 will be:

<Exception A, 1>, <Exception B, 1>, <Exception A, 1>, <Exception C, 1>, <Exception A, 1> → **Combiner :1**
 <Exception B, 1>, <Exception B, 1>, <Exception A, 1>, <Exception A, 1> → **Combiner :2**
 <Exception A, 1>, <Exception C, 1>, <Exception A, 1>, <Exception B, 1>, <Exception A, 1> → **Combiner :3**
 <Exception B, 1>, <Exception C, 1>, <Exception C, 1>, <Exception A, 1> → **Combiner :4**

The output of all Combiners will be:

Combiner 1: <Exception A, 3>, <Exception B, 1>, <Exception C, 1>
 Combiner 2: <Exception A, 2> <Exception B, 2>
 Combiner 3: <Exception A, 3> <Exception B, 1> <Exception C, 1>
 Combiner 4: <Exception A, 1> <Exception B, 1> <Exception C, 2>

Partition Stage

Input:

Reducer 1: <Exception A> {3,2,3,1} = 09
 Reducer 2: <Exception B> {1,2,1,1} = 05
 Reducer 3: <Exception C> {1,1,2} = 04

If there were no combiners involved, the input to the reducers will be as below:

Reducer 1: <Exception A> {1,1,1,1,1,1,1,1,1}
 Reducer 2: <Exception B> {1,1,1,1,1}
 Reducer 3: <Exception C> {1,1,1,1}

Reduce Stage

Now, each reducer just calculates the total count of the exceptions as:

Reducer 1: <Exception A, 9>
 Reducer 2: <Exception B, 5>
 Reducer 3: <Exception C, 4>

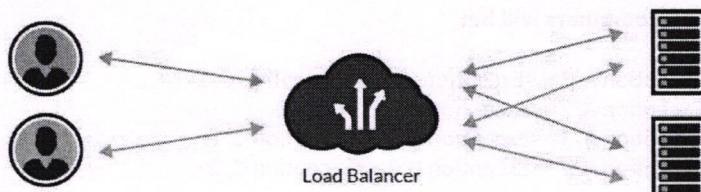
The data shows that Exception A is thrown more often than others and requires more attention.

Q-5 (B) How to enable any load balancer to bind a user's session to a specific target? Is it [05]

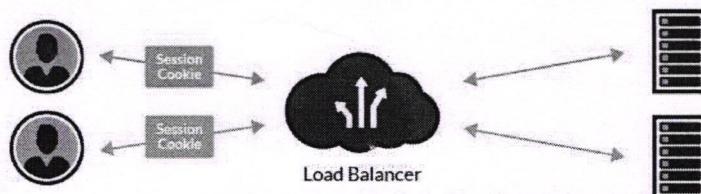
possible to achieve application-based stickiness? Can you guide load balancer to route repeated requests to the same virtual web server whenever possible? How? Demonstrate solution using proper block diagram and justifications.

Ans: Using IP hash based (Source IP and URL based both) can solve this problem. In addition to that – Sticky sessions as shown below helps in achieving application-based stickiness.

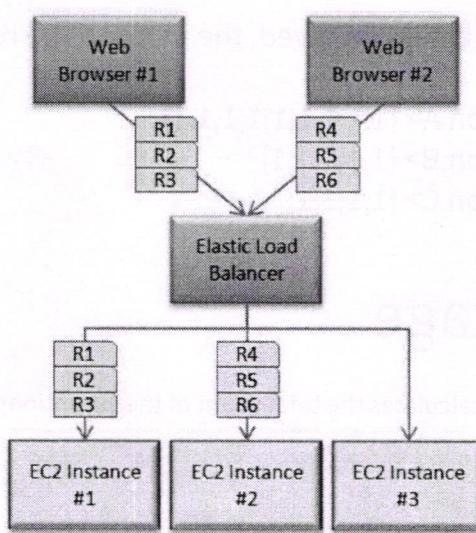
Without Session Stickiness



With Session Stickiness



With the new sticky session feature, it is possible to instruct the load balancer to route repeated requests to the same EC2 instance whenever possible.



Reference:

<https://docs.aws.amazon.com/elasticloadbalancing/latest/application/sticky-sessions.html>

OR

Q-5 (B) Today's consumers expect superior customer service and exceptional shopping experiences. As brick-and-mortar stores seek to win back shoppers, they need new and engaging methods to maintain and grow brand equity while streamlining operations and optimizing revenue. Imagine the scenario & answer the following:

- You walk into your favorite store and are instantly recognized because you opted into the retailer's loyalty program and registered your mobile device.
- A notification on your phone offers you a personalized discount on an item of clothing you viewed online.
- You try the item on using an augmented reality (AR) headset or virtual mirror.
- You pay for the item and take it home without waiting in a checkout line or interacting with a cashier.

Identify the proper services/solutions that can enable this seamless shopping experience for customer from designing and architecture point of view. Is there any added advantage of moving to Edge Computing?

Ans: IoT + Cloud + AR-VR + Edge Computing for retail shopping is the proper services / solutions anyone can think of.

This type of seamless shopping experience is the future of retail. And edge computing is helping to make it a reality for all types of merchants, from local retailers to global brands.

To implement these advances, retailers need a better way to capture, analyze and act on the vast amounts of data generated by customer behavior—and continuously acquire new and better data to help grow their business.

Many of the innovations transforming retail require high-performance, low-latency connectivity and compute to support real-time transactions, insights and actions. And this type of environment is possible only when the devices generating shopper and store data are located close to the end users who are interacting with them.

Edge computing allows retailers to bring computing power nearer to where data is generated, such as workstations, kiosks, beacons, cameras, point-of-sale systems and sensors. Data from these on-premises edge devices can be analyzed in real time and delivered back to store employees in the form of reports and alerts, while other data from multiple retail sites travels to the edge cloud and/or public cloud where it helps optimize predictive models and analytics across the enterprise. Thanks to its ability to collect, store and process data more efficiently than standalone cloud or on-premises data centers, the edge is fueling the always-on, data-driven needs of new retail use cases.

Reference: <https://blog.lumen.com/5-edge-computing-use-cases-revolutionizing-retail/>

Q-6 Attempt ANY TWO questions from following questions.

[10]

- (A) Why Disaster Recovery is important in Cloud? Why you must not choose snapshotting approach for backing up your DB Servers as a part of Disaster Recovery? If Why Multi Cloud deployment is always beneficial in Disasters? Demonstrate with proper real time example.

Ans: Cloud-based disaster recovery offers three key benefits: flexibility, reduced complexities, and most importantly, reduced downtime.

RPO and RTO are two main objectives of DR. These are the Recovery Time Objective (RTO) and Recovery Point Objective (RPO). RTO is the goal your organization sets for the maximum length of time it should take to restore normal operations following an outage or data loss. RPO is your goal for the maximum amount of data the organization can tolerate losing.

We should not choose snapshotting as a backup because in case of disaster snapshots are also lost and cannot be recovered. Only Replication and Site Backup can help you in disaster.

Multiload is a cloud approach made up of more than 1 cloud service, from more than 1 cloud vendor—public or private.

For example, your enterprise invests in expanding a cloud infrastructure. You've moved from bare-metal servers to virtualization-based workloads, and now you're evaluating public cloud options—not for everything, but to support a specific customer-facing application with highly variable use rates. After some research, you find the public cloud provider that has the right blend of service-level agreements (SLAs), security protocols, and uptime to host your custom application. You're happy with your choice. But eventually, customers start asking for features that are only available through a different vendor's proprietary app. Integrating these features into your custom app requires that you not only purchase the vendor's app, but also host the app in that vendor's proprietary public cloud—a solution that allows both apps to scale with demand.

- (B) Consider the sample.txt as below:

Car Deer River

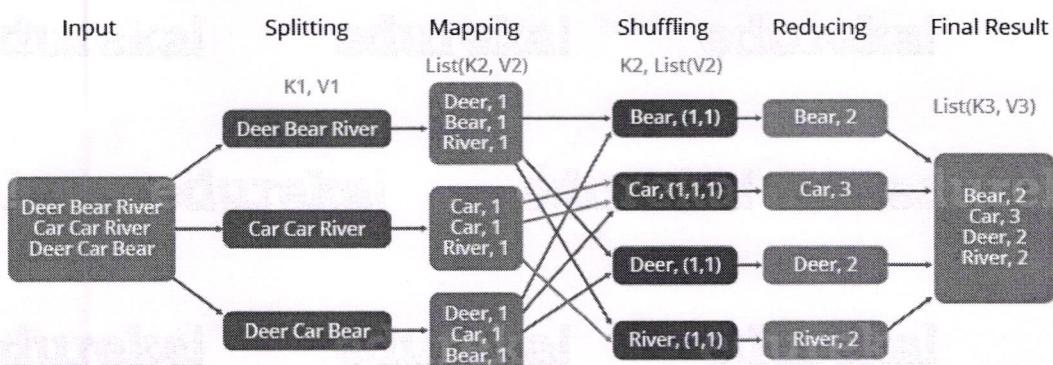
River Bear River

Car Bear Deer

Deer Car River

Perform a word count on the sample.txt using MapReduce Algorithm. Find the unique words and the number of occurrences of those unique words.

Ans:



- (C) Tarun, newly appointed Cloud Expert at FortanCloud Tech Pvt Ltd is in search of prediction-based auto scaling solution of his web servers over the public cloud. As per your opinion, is it possible to adapt such algorithms over public cloud? If yes then how it can be implemented for all web servers? Demonstrate step by step solution.

Ans: Today we are making Auto Scaling even more powerful with the addition of predictive scaling. Using data collected from your actual EC2 usage and further informed by billions of data points drawn from our own observations, we use well-trained Machine Learning models to predict your expected traffic (and EC2 usage) including daily and weekly patterns. The model needs at least one days of historical data to start making predictions; it is re-evaluated every 24 hours to create a forecast for the next 48 hours. We've done our best to make this really easy to use. You enable it with a single click, and then use a 3-step wizard to choose the resources that you want to observe and scale. You can configure some warm-up time for your EC2 instances, and you also get to see actual and predicted usage in a cool visualization! The prediction process produces a scaling plan that can drive one or more groups of Auto Scaled EC2 instances.

Once your new scaling plan is in action, you will be able to scale proactively, ahead of daily and weekly peaks. This will improve the overall user experience for your site or business, and it can also help you to avoid over-provisioning, which will reduce your EC2 costs

Reference: <https://aws.amazon.com/blogs/aws/new-predictive-scaling-for-ec2-powered-by-machine-learning/>

~: END OF PAPER :~



La nouvelle langue devient alors une "langue inventée" ou "langue créée". Les deux méthodes sont très différentes, mais elles peuvent aboutir à la même chose : une langue nouvelle qui peut être utilisée pour communiquer avec d'autres personnes. La méthode de l'invention est généralement préférée par les linguistes et les chercheurs.

La méthode de l'invention consiste à créer une nouvelle langue en inventant des mots et une grammaire spécifiques. Cela peut prendre beaucoup de temps et de travail, mais il existe des logiciels et des outils qui peuvent aider à ce processus. Par exemple, le logiciel "Logotext" permet de créer des mots aléatoires en fonction de critères tels que la longueur, la prononciation, la signification et la complexité. Il existe également des sites web qui proposent des outils pour créer des grammaires simples et cohérentes. Ces méthodes peuvent être utilisées pour créer une langue qui n'existe pas dans le monde réel, mais qui peut être utilisée pour communiquer entre personnes qui ne parlent pas la même langue. Cependant, il est important de noter que la création d'une langue inventée peut prendre beaucoup de temps et de travail, et qu'il peut être difficile de trouver des personnes qui sont intéressées à apprendre et à utiliser cette langue.