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Time taken	1 hour 37 mins
Grade	Not yet graded

Question **1**

Complete

Marked out of 30.00

30 Marks Total.

Indicative Word Count = 500 Words

Scenario:

- Your company is transitioning its services to a cloud environment to enhance flexibility and reduce operational costs. You have been tasked with maintaining this new AWS cloud environment, ensuring its operational integrity, security, and efficiency.
- The cloud setup includes diverse compute resources, a robust storage system, and a database that needs to handle large, dynamic datasets.
- Additionally, the architecture must support automatic scaling to manage load variations and real-time monitoring to quickly identify and address issues.

Essay Question:

- Discuss the technologies and strategies you would implement to maintain this cloud environment.
- Your stakeholder is a non-technical departmental manager and therefore script and overly detailed step-by-step details are not required.

Your discussion / essay should include:

- **Introduction:** Your introduction should include a brief outline of the essay content designed to present a brief overview to inform the non-technical stakeholder of the five sections you are addressing below. **(5 Marks)**
- The **choice** of compute services (e.g., EC2, Lambda) and the **rationale** for using specific types. **(5 Marks)**
- The **types** of storage (e.g., S3, EBS) best suited for high availability and scalability. **(5 Marks)**
- A **description** of Database services (e.g., RDS, DynamoDB) that offer scalability and performance. **(5 Marks)**
- An **explanation** of why you might include automatic scaling and monitoring to ensure optimal performance and cost-effectiveness. **(5 Marks)**
- **Key considerations** in cloud architecture to enhance security and operational efficiency. **(5 Marks)**

Present an **explanation** and **justification** for each of your choices, ensuring you address how each technology / component contributes to the overall maintenance and efficiency of the cloud environment.

- **Introduction:** Your introduction should include a brief outline of the essay content designed to present a brief overview to inform the non-technical stakeholder of the five sections you are addressing below. **(5 Marks)**

As part of transitioning on-premises services to an online cloud enviroment we will be using AWS cloud services as our providers to set everything up from virtual machines, databases, storage and networking all on the cloud. What this means we will be operating the business entirely using online services saving costs and time.

- The **choice** of compute services (e.g., EC2, Lambda) and the **rationale** for using specific types. **(5 Marks)**

We will be using EC2 (Elastic Computing Cloud) these will be our virtual machines we will set up accordingly to the business needs, such as specific storage capacity, CPU, RAM and type of networking etc. We can run multiple machines if required and we can do this by using Lambda. Lambda can severlessly run code when needed so we can focus more on the code writing with web servers and managing applications. This can be automatically running code on servers to generate web applications.

- The **types** of storage (e.g., S3, EBS) best suited for high availability and scalability. **(5 Marks)**

The types of storage best suited for high availability and scalability would EBS, elastic block storage we have as part of our EC2 instances, which offer high speeds and persistent storage such as an D:/ hard drive for our virtual machines. We can have EBS sizes of upwards of many TB which offer plenty room for storage. This will be safe and secure. We can also use S3 (Simple Storage) as way to save massive amounts of data such as applications, documents etc ont the cloud.

- A **description** of Database services (e.g., RDS, DynamoDB) that offer scalability and performance. **(5 Marks)**

Some of the databases we will use would be RDS (Relational Databases Services) which will offer us with some services such as MySQL, MariaDB some databases we can use to store and retrieve data. These databases can be scaled accordingly depending on how much the company requires, and ensuring high performance by enabling cross multi availability zones to help with fault tolerance. We can increase the size of the database, and select the resources to run MySQL or MariaDB at a high level.

- An **explanation** of why you might include automatic scaling and monitoring to ensure optimal performance and cost-effectiveness. **(5 Marks)**

Explanation why we may include automatic scaling and monitoring to ensure optimal performance and cost effectiveness is by knowing we can scale up or down depending on traffic load. Automatic scalings helps with maintaining availbility by allowing EC2 applications to scale up or down meeting the conditions set. Monitoring such as CloudWatch would help provide details of the health of our instances by how much CPU is being used, and setting Alarms to alert the Auto Scaling to either run more instances or less instances as requried.

- **Key considerations** in cloud architecture to enhance security and operational efficiency. **(5 Marks)**

Key considerations in cloud architecture to enhance security and operatonal efficiciency would be introducing IAM (identity access management) for authorised users to be granted specific permissions that are tailored to the roles of the user or employee in this case. For operational efficiency we can add a service to keep track of the setting up and have the ability to be able to go make adjustments as per necessary. As part of enhancing security we can also manage security groups and modify rules to either keep the network secure.

Present an **explanation** and **justification** for each of your choices, ensuring you address how each technology / component contributes to the overall maintenance and efficiency of the cloud environment.

The explanation and justification for each of these choices is it meets the business requirements, having EC2 (virtual machines for employees to use), EBS (storage for our virual machines) or S3 (large storage capcaity to save), RDS (to manage databases - SQL/MariaDB retrieve or store data), Auto Scaling (variability in the network to use more EC2 if needed or less during peak or off peak times), IAM (security measures and groups) are all components that effectively contribute to the overall maintainance and efficiency of the cloud enviroment.

Question **2**

Complete

Marked out of 30.00

30 Marks Total

Indicative Word Count = 500 Words

Scenario:

- A New Zealand startup specialising in data analytics for healthcare is preparing to deploy its application in the cloud.
- The application requires high availability, secure data handling, and the ability to scale quickly due to unpredictable demand from hospitals and clinics.
- The AWS cloud environment should be set up to handle large volumes of sensitive data securely, comply with healthcare regulations, and provide seamless access to analytics services.

Essay Question:

- **Discuss** the steps you would take to configure this cloud environment using AWS services.
- Your **stakeholder** is a non-technical departmental manager and therefore script and overly detailed step-by-step details are not required.

Your response should address:

- **Introduction:** Your introduction should outline what compliance best practice looks like in Health Care in NZ. **(5 Marks)**
- The **configuration** of compute instances (e.g., EC2, ECS) to ensure high availability and regulatory compliance. **(5 Marks)**
- **Strategies** for setting up secure and compliant storage solutions (e.g., S3, EFS) that safeguard patient data. **(5 Marks)**
- How to **configure** database services (e.g., RDS, Aurora) for handling large-scale sensitive data while ensuring data integrity and security. **(5 Marks)**
- **Techniques** for setting up automatic scaling to manage load spikes during critical operational periods. **(5 Marks)**
- The **implementation** of monitoring tools and services to ensure real-time health checks and compliance monitoring of the cloud environment. **(5 marks)**

Describe how each step adheres to best practices in cloud architecture, particularly in ensuring compliance with New Zealand healthcare industry standards and regulations.

- **Introduction:** Your introduction should outline what compliance best practice looks like in Health Care in NZ. **(5 Marks)**

The best compliance practice looks like in Health Care NZ is ensuring data is protected, confidential and safe. There is a requirement to ensure we can offer high availability, secure data handling, and the ability to scale quickly due to undepredicability. This is by keeping all records to be availabile when needed, and handing the high volume of data to ensure these are safe with multiple access points.

- The **configuration** of compute instances (e.g., EC2, ECS) to ensure high availability and regulatory compliance. **(5 Marks)**

We can have EC2 compute instances tailored to the needs of the data healthcare clinic. We can have this configured accordingly, so for a data analytics company we would need virtual machines with specific operating systems such as Windows, and approprate software running on the machines. We can have upto 2 vPCU's running, reasonable sized RAM/CPU power to operate any data analytic programs. These can be MySQL, R Studio, Microsoft PowerBI, etc already configured o the machines. The high availbility would be creating these in multiple availbility zones and meeting regulatory compliance by enforcing any managed policies to these virtual machines.

- **Strategies** for setting up secure and compliant storage solutions (e.g., S3, EFS) that safeguard patient data. **(5 Marks)**

Strategies for setting up and securing compliant storage solutions would be for S3 (simple storage) across multiple availbility zones with security groups and kept in a virtual private network. Again S3 offers massive room to store enormous amounts of data upto 16TB on the cloud. These safe guard data, for redudancy, and encrypting the data so only those authorised (with public key) can access the data. Peristent storage would be highly recommend and a secondary backup of the storage in a second availabilty zone.

- How to **configure** database services (e.g., RDS, Aurora) for handling large-scale sensitive data while ensuring data integrity and security. **(5 Marks)**

A large DB for a data analytics comany could be the Amazon Dynamo DB that could be used. This ensures data integrity and security as it offers high speed, encrypted services to protect volumes of data. The patient data would be encrypted and highly availabile. Amazon Auraro could also manage large scale sensitive data and keep all records secure. These vary in costs and are often of size. To configure these we can set them up in the AWS managment console, storage, and selecting the list of services available - RDS/Aurora, DynamoDB. Redshift is also another good database service like a large warehouse that could also be set up.

- **Techniques** for setting up automatic scaling to manage load spikes during critical operational periods. **(5 Marks)**

Techniques for setting up automatic scaling, would be to create an AMI machine image of the web server, then create a launch template using the AMI. A target group would be configured for example VPC (data analytic network) and then a load balancer connected to internet facing subnets. Auto scaling would then be created to implement cloned (extra machines) to handled spikes. What could enable this is CloudWatch and alarm set up. The alarm would trigger auto scaling to create the extra machines (launch template) when needed. This effectively manages the load spikes that can happen during critical operational periods. What could also help, when setting up auto scaling is increasing the number of desired CPU's.

- The **implementation** of monitoring tools and services to ensure real-time health checks and compliance monitoring of the cloud environment. **(5 marks)**

Real time checks can be done in the AWS management console, there are way to see the health status of the instances (simply by seeing the dash board), and enabling services such a Amazon LightSail to keep track of everything that is happening, this can be a way of monitoring and keeping records of what changes have been made, such as increasing storage capacity, RAM etc. The compliance moitoring of the cloud enviroment can be IAM users, or managing groups to associate which users with given access privilledeges should be part of.

Question **3**

Complete

Marked out of 40.00

40 Marks Total

Indicative Word Count = 600 Words

Scenario:

An e-commerce company has recently migrated its operations to AWS to leverage the cloud's scalability during peak shopping seasons.

However, they are encountering several operational challenges that include intermittent access issues, and unexpected auto-scaling behaviours which are impacting customer experience.

The technical team needs to quickly identify the root causes and apply corrective actions to stabilise the environment.

Essay Question:

- **Describe** a systematic approach to troubleshoot and resolve the issues faced by the e-commerce company.
- The **stakeholder** is a Systems Team Lead, and therefore has a highly technical skill-set.

In your essay, include:

- **Introduction**: Your introduction must discuss overall troubleshooting techniques **(10 Marks)**
- **Steps** to diagnose and address the intermittent access issues, possibly related to misconfigured security groups or load balancers. **(10 Marks)**
- **Methods** to analyse and correct the unexpected auto-scaling behaviours, ensuring that scaling policies and metrics are correctly set up. **(10 Marks)**
- **Recommendations** on monitoring tools and practices to detect early signs of similar issues in the future, preventing downtime and service disruptions. **(10 Marks)**

Detail each troubleshooting step and explain how applying these actions would mitigate the problems, thereby stabilising the cloud environment for the e-commerce operations.

- **Introduction**: Your introduction must discuss overall troubleshooting techniques **(10 Marks)**

We have an operation challenge that includes intermittent access issues, and unexpected auto scaling behaviours that are impacting customer experience. We will describe a systematic appraoch to troubleshoot and resolve the issues faced by the e-commerce company. The troubleshooting techniques we would be using is to check the IAM, health status, security groups and inbound/outbound rules. Using AWS troubleshooting prompts, and research what could further assist with what we can do to counteract the operation challenges the company is facing. We can indentify key metrics, by analysing live-time data to see whether there is an uneven distribution of traffic (load balancing scaling issues), whether there are enough instances running with sufficient computing power (RAM/CPU/Storage). We can see what policies have been enforces in the IAM. Many of these trouble shooting techniques could possible help resove the issues and lead to discovering the root causes of the problem.

- **Steps** to diagnose and address the intermittent access issues, possibly related to misconfigured security groups or load balancers. **(10 Marks)**

We would access the AWS console, select netowrking services, select IAM. Using IAM, we can see what policies are currently associated with what user, and to make sure they have appropriate access to what they need. This could be done by checking the security groups and identifying those who are facing intermittent access issues to be associated with those groups to be granted accesses. In the VPC, we can check the security groups and checking the inbound rules and seeing if the correct ports are open and are allowing traffic. Other issues could be to see if the network is in the correct subnet, internet facing and a NAT gateway has been set up. There could also be any instances of issues of launch template set up where IAM users were not specified during configuration that would result in a reset set up. Load balancers need to make sure the correct target group is being selected, and the associated security group is consistent with the network

traffic mangement. To diagnose and address these issues requires a complete overview of what we have outlined, checking and testing ports, consistency in the endpoints and networking/subnetting traffic to ensure these security groups and load balances are situated where it should be.

- **Methods** to analyse and correct the unexpected auto-scaling behaviours, ensuring that scaling policies and metrics are correctly set up. **(10 Marks)**

Methods to analyse and correct the unexpections auto scaling behaviours could be to see what the setting were set in the CloudWatch/Alarm, to make sure what is being deployed is meeting the e-commerce business functionality by triggering instances at the appropriate times. The unexpected auto-scaling behaviours could possbily be an incorrect CPU 60% and configuration of instances launch that could be impacting customer experience. To analyse this is see what the numbers are in the AWS console, and offering to test if instances are launched during peak times. If an E-commerce website was running with insufficient application servers this would direcly impact by either slow performing and operating systems online. The load balance can be checked and seeing whether the correct target group has been selected, so we can see the divertion of traffic that would be picked up by auto scaling to eventually trigger the required resources to keep the business efficiency afloat. To ensure the right amount of machines with the right amount of power and specifications for the business requirements and are designed according to needs. These are vairous methods we can use to correct the unexpected auto-scaling behaviours to ensure scaling policies and metrics are correctly set up.

- **Recommendations** on monitoring tools and practices to detect early signs of similar issues in the future, preventing downtime and service disruptions. **(10 Marks**

Recommendations on monitoring tools and practices to detect early signs of similar issues in the future would be perhaps a complete recheck of the entire set up, using key tags to keep track of all the different components set up for the cloud network, that way can easily resort to what fault and connections to that line of input. Using the troubleshoot help provided by AWS which does have a list of some probable issues users combat in the cloud. Running tests before complete deployment could prevent downtime and service disruptions, as using a non-live enviroment could assist with creating a simulation of the cloud network you wish to set up before a live deployment resulting in costs and time. Or by reaching out to an AWS support team member who can further provide some knowledge or helpful guidance in navigating these cloud business set up envdeavours. These are some ways to prevent downtime and service disruptions.