Lab Exam Quiz

Subject 1

Question 1
What is the difference between a Docker image and a Docker container?

- Containers are running instances of the images

Question 2
Which service models does Amazon Web Services provide?

- SaaS
- PaaS
- IaaS

Question 3
Simple Storage Service (S3) helps us

- Store and serve an infinite amount of objects such as images, documents, and videos

Question 4
What is CloudFormation?

- IaC Service

Question 5
Why are there multiple availability zones in one region?

- To enable highly available architectures and redundant storage

Question 6
AWS EC2 is a service designed for

- Creating virtual machines that can act as servers

Question 7
An EC2 instance can be configured as follows

- Based on an instance type which offers certain resources (vCPU, RAM, networking, etc.)

Question 8
The AWS service for load balancing supports the following types of load balancers:

- Application load balancer which operates at *OSI Layer 7 (HTTP/WebSockets)*
- Network load balancer which operates at *OSI Layer 4 (TCP/UDP)*
- Gateway load balancer which operates at *OSI Layer 3 (Network)*

Question 9
An EC2 instance can be secured by using
security groups which *control the inbound and outbound traffic*.

Question 10
RDS is a

- managed relational database service

Question 11
The connection times out while trying to access an EC2 instance via SSH on the standard port. What is the most likely issue?

- The security group does not explicitly allow traffic on port 22

Question 12
Objects stored in S3 can be made public by configuring the
bucket policy | at any time

Question 13

You are designing a three-tier web application and want to restrict access to the database tier (remember PostgreSQL instance) to accept traffic from the application servers only (Spring Java app). However, these application servers are in an Auto Scaling group and may vary in quantity. How should you configure the database servers to meet the requirements?

- Configure the database security group to allow database traffic from the application server security group.

Question 14

Content stored on S3 can be restricted such that it's accessible only through CloudFront by using

- Origin Access Identity

Question 15

Question text:

You and 2 friends are the founders of a tech startup. Your idea is a SaaS product enabling content creators to edit images and videos through a web application. You decided to host the platform on AWS since this is where you have the most expertise.

Content creators will edit their footage directly on their devices (client-side), however, the footage must first be transcoded by the system in order to optimize storage and edit performance. The latency of the transcode operations is not critical, but users must be notified when their footage is ready for work. Additionally, premium users can choose to make their content available to certain people, which might be located anywhere on the globe, mostly to gather feedback. The platform also exposes a public API enabling integration with other platforms.

The backend is built with C++ and Node.js, it's designed to work with PostgreSQL, and the client application is built with Angular.

Your goal is to reduce operational overhead as much as possible (due to the small team) and to optimize cost.

Describe your solution below. Mention which AWS services you would choose, how they communicate with each other, and, equally important, why you have chosen a particular service. Be as explicit as possible.

Optionally, you can upload images to illustrate your design (feel free to use any drawing or diagram tool you wish; images don't have to be pretty).

Answer text:

We will need a **Virtual Private Cloud (VPC)** aka our own slice of the AWS network for communication using private IP addresses.

Inside it:

- **Public Subnet** with:

    - an **Elastic Container Service (ECS)** is a fully managed container orchestration service to run our backend application built with C++ and Node.js

    - **ECS** orchestrates **Docker containers**, but the containers run on the virtual machines provided by **EC2 instances (ECS EC2 Nodes)**

    - an automatic way to create instances of our app so we can use **Launch templates** (how we tell AWS how to run our app on EC2) and an **Auto Scaling Group (ASG)** (how we tell AWS how many instances of our app we want) this will allow us to scale our resources based on demand and also reduce costs by using reserved instances

    - plus we could use an **Application Load Balancer** using **Elastic Load Balancer (ELB)** to make the app more resilient and efficient -
if one server goes down, the load balancer will direct the traffic to another server, thus the app will remain available and the user experience is not affected

- **Private Subnet** with:

    - **RDS** to manage our PostgreSQL database, accessed by EC2 instances for data storage and retrieval

    - we need a place to store all our data and **RDS** is a managed database service that takes care of backups, scaling, etc. for us

- Traffic control:

    - we would need **3 Security groups (SG)** one for the application, one for the database, and one for the load balancer

Simple Storage Service (S3)

to deploy our client application built with Angular and to store our users' content - since it can handle loads of traffic is a cost-effective & secure storage solution and is ideal for storing large media files.

An **S3 bucket** is deployed in a certain region so we will need also **Cloud Front Distribution** [content delivery network (CDN)] to serve content to our users around the world because it's fast and has some advantages like its global network and edge locations. This fetches content from S3 and serves it to users worldwide. This is useful for premium users that can choose to make their content available to certain people, which might be located anywhere on the globe.

API Gateway to expose our public API to other platforms. It can manage all incoming traffic to our server-side operations. Connects with Lambda and EC2 instances for backend logic.

Lambda it's a platform that can manage our specific service of transcoding users' content to optimize storage and edit performance. It runs our backend code in response to events (like HTTP requests from API Gateway or S3 events like when a user uploads footage - where the output can be saved back to S3) without us managing servers. Plus, you only pay for the compute time you use.

Another **Lambda** can also interact with an **SNS Topic** and **SQS Queue** to notify users. **SNS Topic** is a pub/sub service that we can use to send message notifications to users when their footage is ready for work and the **SQS Queue** is a message queue for storing messages ensuring that messages between services don't get lost, even if one service is busy or down.

Since we are a team of 3 we will also use **AWS, IAM (Identity and Access Management) users, groups, or roles** to manage access to services and resources. We might also add **Cognito User Pools** to store, create, and authenticate users and remove user management from our application.

Subject 2

Question 1
What is the purpose of the Dockerfile for Docker?

- It contains all the commands and steps for assembling a Docker image

Question 2
Security groups act at the
instance level, not the *subnet* level.

Question 3
RDS is a

- managed relational database service

Question 4
Simple Storage Service (S3) helps us

- Store and serve an infinite amount of objects such as images, documents, and videos

Question 5
Every instance in a subnet in a VPC can have assigned a different set of
security groups

Question 6
An AWS availability zone is:

- An isolated location, part of a specific region, in which resources can be deployed

Question 7
The AWS service for load balancing supports the following types of load balancers:

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Question 8
What is CloudFormation?

- IaC Service

Question 9

An EC2 instance is deployed in a specific AZ

- True

Question 10

If you need just one EC2 instance, would an auto-scaling group (ASG) provide any benefit?

- Yes, the ASG will ensure there is always one instance running

Question 11

You are designing a three-tier web application and want to restrict access to the database tier (remember PostgreSQL instance) to accept traffic from the application servers only (Spring Java app). However, these application servers are in an Auto Scaling group and may vary in quantity.
How should you configure the database servers to meet the requirements?

- Configure the database security group to allow database traffic from the application server security group.

Question 12

The connection times out while trying to access an EC2 instance via SSH on the standard port. What is the most likely issue?

- The security group does not explicitly allow traffic on port 22

Question 13

Your application tier is running in an Auto Scaling Group and you need to change the instance type. In which of the following area can this be achieved?

- Auto scaling launch template/configuration

Question 14

How does ECS ensure the cluster has enough computing capacity when running on EC2?

- It leverages an ASG

Question 15

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The backend is built with C++ and Node.js, it's designed to work with PostgreSQL, and the client application is built with Angular.

Your goal is to reduce operational overhead as much as possible (due to the small team) and to optimize cost.

Describe your solution below. Mention which AWS services you would choose, how they communicate with each other, and, equally important, why you have chosen a particular service. Be as explicit as possible.

Optionally, you can upload images to illustrate your design (feel free to use any drawing or diagram tool you wish; images don't have to be pretty).

Answer text:

Me and my 2 friends would most likely use the following aws services to build our tech startup:

1. EC2, for hosting our web application, this will allow us to scale our resources based on demand and also reduce cos

2. S3, to store our users' content, since it is a cost effective, secure storage solution.

3. CloudFront, to serve content to our users around the world, because it's fast and has some advantages like its global network and the edge locations.

4. Lambda, because it's a platform that can manage our specific service of transcoding users' content and we dont have to worry about the servers, and it is cost effective - we would only pay for the duration that the lambda

executes and the recources that it uses, so cheap.

5. SQS, to send messages to our users when their content is ready for work, as it is a reliable, cost effective notification system, and in the plus size it doesn't need additional infrastracture from our side.

6. API Gateway, to expose our public API to other platforms. API Gateway is again, like the other aws services, a secure, cost effective, easily manageable, service - API endpoints, how could we not use it?

We could also use AWS Fargate to run our backend code and RDS to manage our database.

Additionally, we could use an Application Load Balancer to make the app more resilient and efficient. If one server goes down, the load balancer will direct the traffic to another server, thus the app will remain available and the user experience is not affected.

We have chosen those services to minimize cost, and build the product in an effective manner, but in the future, as the app grows we may need to adjust our architecture, depending on its needs.

Additional Questions

Question 1

CloudFront can serve the following:

- HTTP Traffic from API Gateway

- Content stored on S3

Question 2

An EC2 instance runs in specific ***Availability Zone(AZ)*** based on which ***both public and private*** IP addresses are assigned to the instance

Question 3

Software can be automatically installed during the provisioning of the EC2 instance through ***User Data*** which is composed of ***A series of shell commands.***

Question 4

The most cost-effective and scalable way to host a static web application on AWS is

- Simple Storage Service (S3)

Question 5

RDS can:

- upgrade the RDBMS automatically

- encrypt the data

- backup the database automatically

Question 4

Docker is a

- container engine

Question 5

An AWS Region is

- an AWS data center

Question 6

Documents are stored in S3 in a

- Bucket

Question 7

Simple Storage Service works through

- HTTP

Question 8

CloudFront is a(n) **CDN** and is composed of **a network of edge locations**

Question 9

VPCs allow you to control the traffic between **(sub)networks** and use **private IPs**

Question 10

You can choose the AZ in which an EC2 will run by:

- Selecting a subnet for that specific AZ

Question 11

From where does Docker pull the image *hello-world* when running *docker run hello-world*?

- Docker tries to find it locally. If it doesn't find it, Docker checks the Docker Hub