Quiz 1
04/10/20 6:00pm-8:00pm

This is an open book quiz. However you cannot use internet nor phone. If you are caught using Internet or phone, you will get a default zero and may be reported to the Dept. You are bound by Columbia Academic Honesty pledge.

A. Questions based on Assignment 1 [25 Points]

1. You have a payment API that calls a third party API service to make payments. The API receives millions of requests per hour. At some point, the payment service, starts failing intermittently due to the high volume of transactions.

> How would you re-architect the system to ensure that all payments are processed without an impact to the customer experience?

2. What steps would you take in API Gateway to secure your API? Your goal is to both authenticate and authorize the users. (describe every step)

You now decide to create an Amazon Lex bot and call the bot from your Lambda function. Once you finished the setup, you start making API calls from your frontend to your API again, but you realize that the Lambda function that is supposed to call Lex times out after 30 seconds

3. What is the most likely issue with the Lambda function's timeout?

You fixed the timeout issue and you start testing the bot through your frontend. After a few tries you notice that your bot is not picking up the RestaurantRecommendationIntent that you set up in Lex. You check the Lex console on AWS and confirm that the intent is there and that you can test it through the AWS console.

4. What is the most likely reason for the missing RestaurantRecommendationIntent? How would you solve it?

5. When would you use Elastic vs DynamoDB? Give examples to illustrate when one is preferable over the other.

B. Design Question [25]

You are designing a Smart Photo Album service using AWS Cloud as backend platform. You need to design the service that will support the following functionality:

- User using the mobile application logs into this service. The mobile application uploads the new photos to this platform.
- New photos are processed by this service to create (i) thumbnail with lower resolution and (ii) image tagging. You can assume that such image processing libraries are available.
- Once thumbnails are generated, these are downloaded back to your mobile application. It deletes the original pictures replacing by thumbnails.
- The mobile app allows user to search for pictures using the tags – search is completed in the backend.
- When user taps on a thumbnail, the backend supplies the original picture.

You need to clearly state the following:

- A complete scalable event driven architecture that is along the line of Assignment 1.
- It should list the supporting APIs and Lambda functions and specify the trigger events, ouput for each Lambda function.
- For the thumbnail creation and on tap download of original image – state the end-to-end data flow diagram.

C. Lecture Notes [5+5+5+10+10]

C.1 What is a hybrid cloud? Explain through examples/use cases when it is beneficial over a solely public cloud and/or a private cloud. In other words, when and why one would benefit from hybrid cloud.

C.2 What is the role of a message queue like SQS in a cloud based system? Give an example to show with and without SQS what would be the comparative benefit with SQS.

C.3 We have discussed about Virtualization, Container and Serverless (Lambda in AWS) compute model. Illustrate through an example when you would use one over the other and their relative benefits and drawbacks.

C.4 Describe how you may implement an AWS Lambda like serverless capability using container.

C.5 Construct a cloud devops pipeline leveraging appropriate AWS services. Your design should assume that your code repo is in GitHub and target environment is deployment of set of micro services using AWS container service. Illustrate through appropriate diagram and illustration.

D. Questions from Papers [25]

C.1: [GFS] Explain the key steps involved when a file is submitted to a GFS to be stored including a diagram that illustrates the interaction among the key components.

C.2: [GFS] Suppose you run out of space in a GFS system. You decided to add a new server with a set of new disks. Illustrate how rebalancing takes place to take advantage of the new added space in GFS.

C.3 [BigTable] Explain Big Table structure through row key, column key with examples.

C.4 [Big Table] How is bloom filter utilized in Big Table?

C.5 [DynamoDB] How does DynamoDB handle consistency? Why is it different from typical transactional system?