
Quiz 1 10/14/21 5:00pm-7:30pm

This is an open book quiz. But no internet access is permitted. If you are caught using internet, your default score in the Quiz would be 0.

A. Questions from 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. When you call the API from your frontend application hosted at <http://www.yourdomain.com>, you get the following error in the developer console:

“No 'Access-Control-Allow-Origin' header is present on the requested resource. Origin '<http://www.yourdomain.com>' is therefore not allowed access.”

> What is the reason for this error? How do you resolve it? (describe every step)

3. You create a new Lambda function that returns the text "Hello world". You test it and it completes the execution in a few milliseconds. You then decide to use it to store a message in a DynamoDB table. You add code to do just that, on top of the original code. Upon testing the new version of the function, it times out after 3 seconds, over and over again.

>What might be the issue and how can you resolve it?

4. You create a new intent called HotelBookingIntent in Lex. You add a few utterances and build it. When you start testing it in the Lex test console, everything works as expected. You then write code to call your Lex bot from the Lambda function, but when you make calls to your API, the Lambda function times out.

> What is the most likely reason for the Lambda function timing out when connected with the Lex bot, while everything is working correctly through the Lex test console?

5. For the following questions, imagine you have the following resources on AWS: an API Gateway deployment, a Lambda function connected to one of the API Gateway methods that responds to each request, and a Lex bot called "Concierge". You create a new intent called HotelBookingIntent in Lex. You add a few utterances and build it. When you start testing it in the Lex test console, everything works as expected. You then write code to call your Lex bot from a Lambda function, but all the incoming messages are not understood by the Lex bot.

>What is the most likely reason for Lex failing to understand messages sent through the Lambda function, yet everything working correctly through the Lex test console?

B. Design Question [25]

You will design a food delivery app that will allow you to order food online. You could draw inspiration from any of the food delivery apps you use. You are required to list the set of APIs, backend architecture, data store design and event interactions as part of this system design for the following requirements:

Users:

- Login and set profile to configure their address, phone contact, payment information.
- Order food from menus of restaurants near your zip code, provide delivery address, and do online payment. You could assume external APIs for payment etc. For example, you may assume Paypal for payment.
- You are emailed a copy of your order with payment details to your mobile phone as SMS or email based on your set preference.
- You get a notification back once the restaurant received the order and processed it with an estimated time for the delivery.

Restaurants:

- Restaurants sign in to create an account for its location with menu/price.
- The restaurants could update the menu.
- Restaurants confirm order and provide you estimated time for delivery and a contact number for the delivery person. Your contact number is shared by the backend to the delivery person.

What you need to provide:

1. Scalable backend architecture details along the lines of Assignment 1.
2. List of APIs that the food ordering app (both for users and restaurants) need to support the requirements that are listed above.
3. List of Lambda functions to support these set of APIs.
4. Data models (just informal description is fine) and where these would be stored. You should consider appropriate databases/datastores for various data pieces for optimal performance.
5. You need to detail the event interaction for the user ordering the food function starting from API to API gateway to Lambda(s) and data stores. This should show the interaction among these for this specific function.

State your assumptions you are making. Your application should scale to millions of users and should be event driven and asynchronous.

C. Questions from Papers [25]

C.1: [GFS] Specify three most important considerations/rationale behind Google to design GFS. Also specify what design choices were made to address these in GFS.

C.2: [GFS] Illustrate through examples what happens if a chunk server goes down in GFS, i.e., how the self-healing process takes place.

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 [MR] Describe what happens if a task tracker fails while executing a map task – how job tracker detects it and what action it takes.

D. Lecture Notes [25]

D.1 What is live VM migration? Describe the process through “iterative copy” with an illustration? Why shared storage between source and destination VM is required for live migration?

D.2 What is the benefit of a private cloud? Provide three reasons why Enterprises are adopting this even though they need to invest in the infrastructure. How does Hybrid cloud help?

D.3 What is the key difference between Full and Para virtualization? D.4 What is the benefit of serverless architecture? Why is it scalable?

D5. What is the role of a message queue system like Kafka/Kinesis/SQS in the overall design of a system?