CS 470 PROJECT TWO CONFERENCE PRESENTATION: CLOUD DEVELOPMENT

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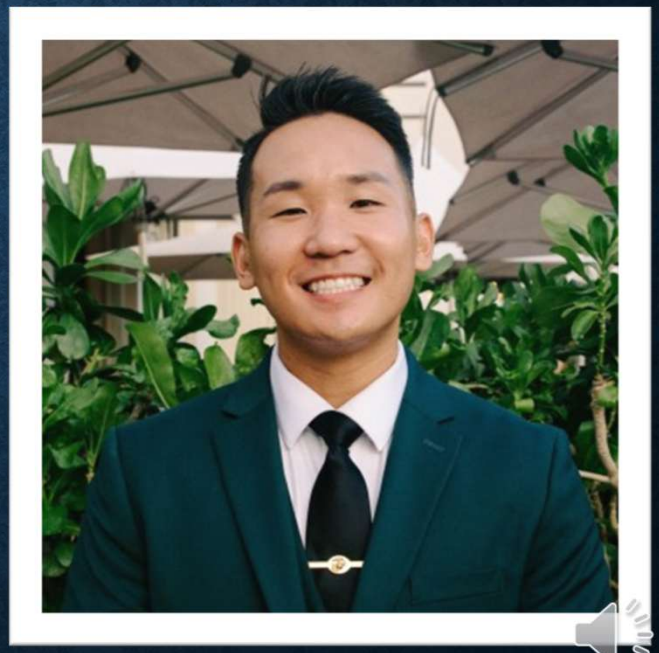
INTRODUCTION

- Name: Isaac Jang
- Current Senior @ SNHU
- Majoring in Computer Science

- Discussing Cloud development in both technical and non-technical aspects



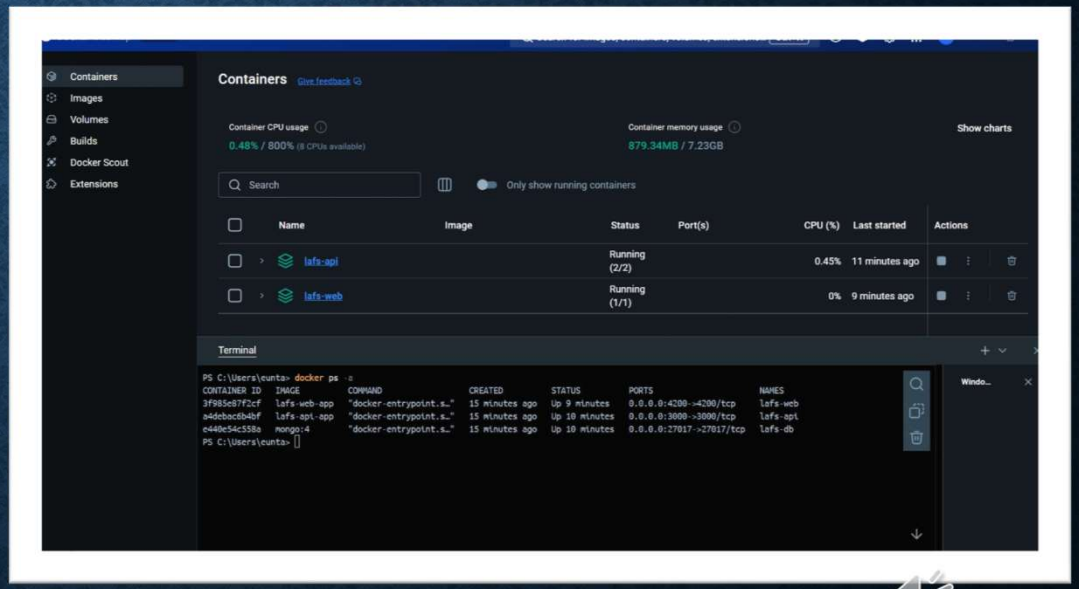
CONTAINERIZATION

- Migrating from full stack to the cloud:
  - Lift & Shift, Replatforming, and Refactoring
  - Primarily used Replatforming

- Tools We Used:
  - Docker / Docker Compose

ORCHESTRATION

- What is the value of using Docker Compose?
  - Multiple Containers
  - Configure file: docker-compose.yml
  - Easy to Set Up and Share
  - Automates Connections
  - Saves Time



THE SERVERLESS CLOUD

What is "Serverless"?

- Servers are managed by cloud provider (AWS, Azure, GCP)

Describe the advantages of using a serverless API?

- Advantages:
  - No Server Management
  - Scalability
  - Cost Efficiency
  - High Availability

THE SERVERLESS CLOUD

What is S3 storage and how does it compare to local storage?

- S3 (Simple Storage Service)
- Advantages:
  - Accessibility
  - Scalability
  - Durability
  - Cost
  - Integration

THE SERVERLESS CLOUD - LAMBDA

Lambda API Logic:

- Event-Driven Execution
- Stateless Design
- Integration with Services
- Minimal Code for Maximum Output

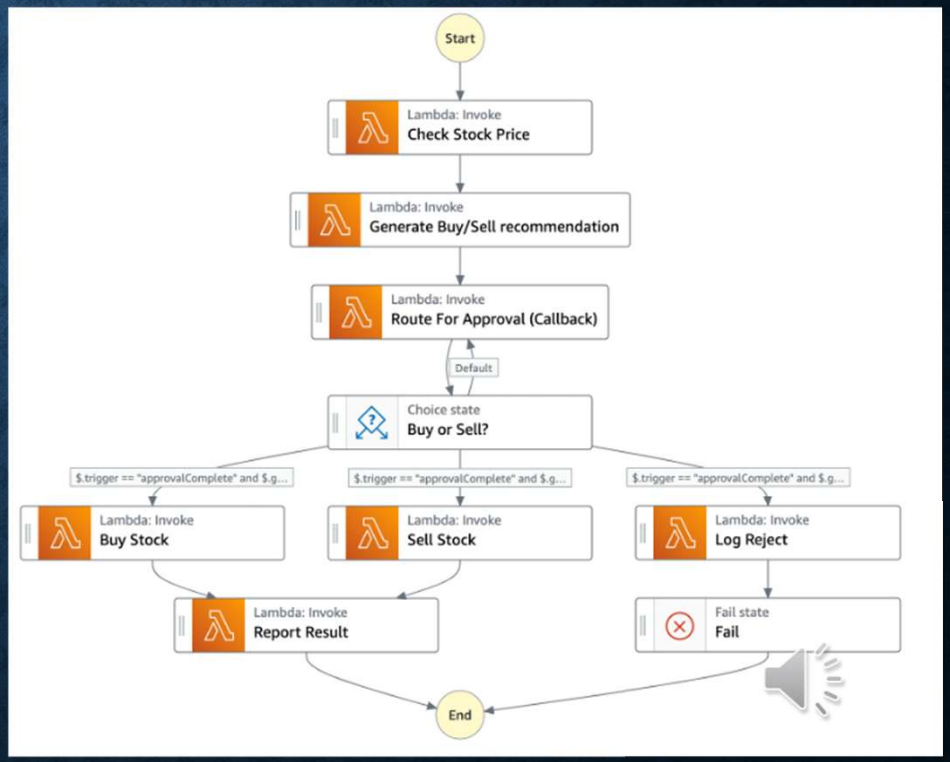
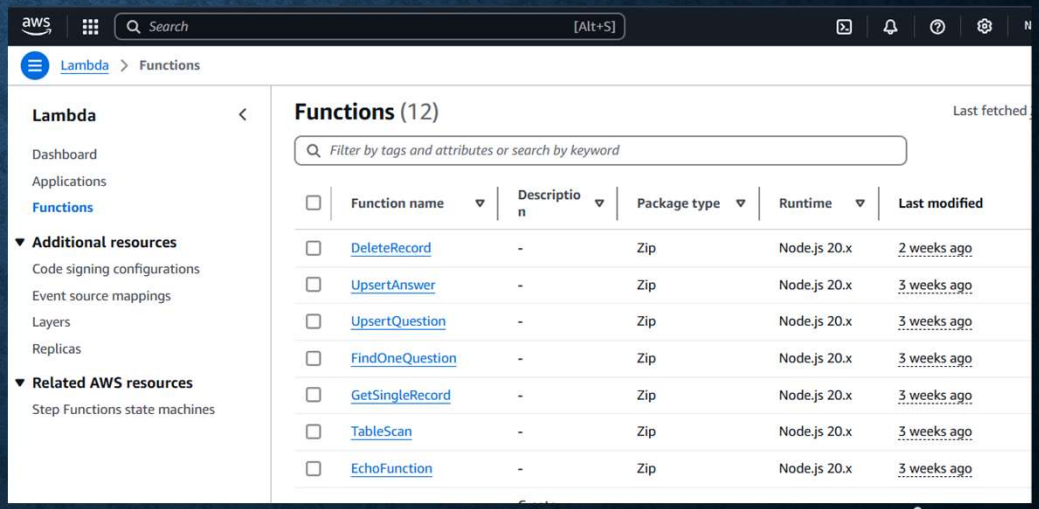


Image Reference:
Smith, B. (2022, October 27). *Implementing a UML state machine using AWS Step Functions*. AWS Compute Blog. Retrieved from https://aws.amazon.com/blogs/compute/implementing-a-uml-state-machine-using-aws-step-functions/

THE SERVERLESS CLOUD - SERVERLESS INTEGRATION

Serverless Integration:

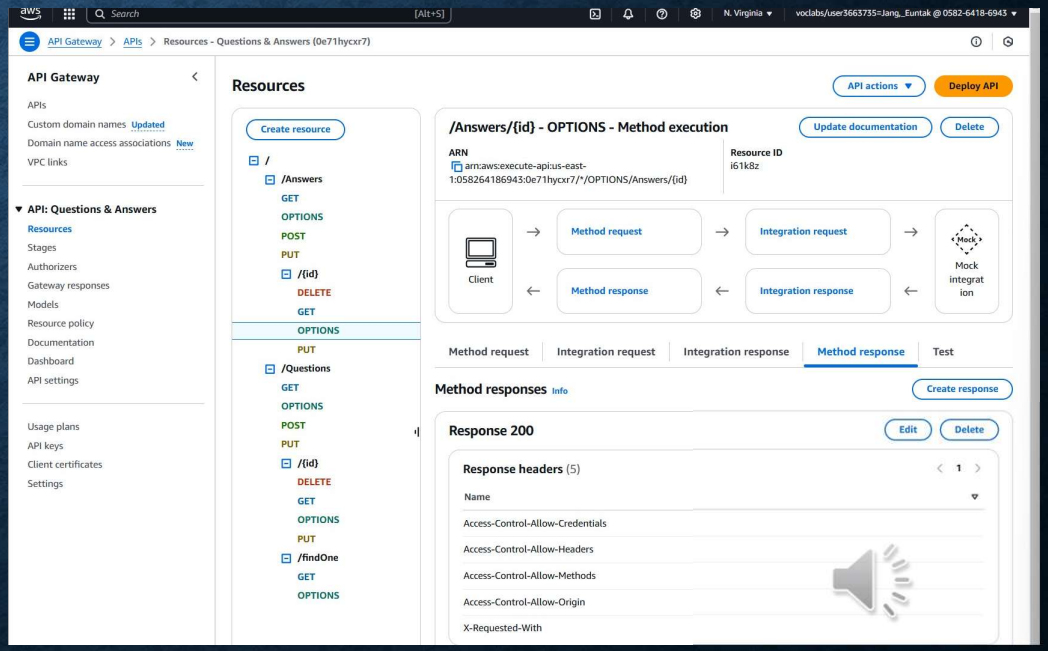
- Lambda Function Code
  - CRUD Operations
- IAM Role Policies
- API Gateway Configuration



THE SERVERLESS CLOUD - INTEGRATE FRONTEND WITH BACKEND

Steps to Integrate Frontend with Backend:

- Update Environment Variables
- Enable & Configure CORS
- Deploy Frontend
- Test Integration



THE SERVERLESS CLOUD - DATABASES

MongoDB vs. DynamoDB

Feature	MongoDB	DynamoDB
Data Model	Document-based (JSON-like BSON documents)	Key-value and document-based
Schema	Schema-less, flexible, and dynamic	Requires a primary key and optional sort key
Indexes	Manual indexing required for performance	Built-in indexing (global and local indexes)
Storage	Self-hosted or cloud options available	Fully managed by AWS with auto-scaling

THE SERVERLESS CLOUD – DATABASE QUERIES

MongoDB Queries

```
Find Documents:
db.collection('questions').find({ category: 'AWS' });

Insert a Record:
db.collection('questions').insertOne({ question: "What is DynamoDB?", category: "AWS" });

```

DynamoDB Queries

```
Get an Item by Key:
const params = {
  TableName: 'Questions',
  Key: {
    id: '12345'
  }
};
dynamoDB.get(params).promise();

Scan for All Items:
const params = { TableName: 'Questions' };
dynamoDB.scan(params).promise();
```

THE SERVERLESS CLOUD – DATABASE SCRIPTS

MongoDB

- Node.js code for connecting to MongoDB using the MongoDB client.
- CRUD operations written for interaction with collections.

DynamoDB

- Lambda Functions: Scripts to handle GetItem, PutItem, Scan, and Query requests.
- IAM Role Policies: Scripts granting Lambda permissions to perform DynamoDB actions (dynamodb:Query, dynamodb:Scan, etc.).

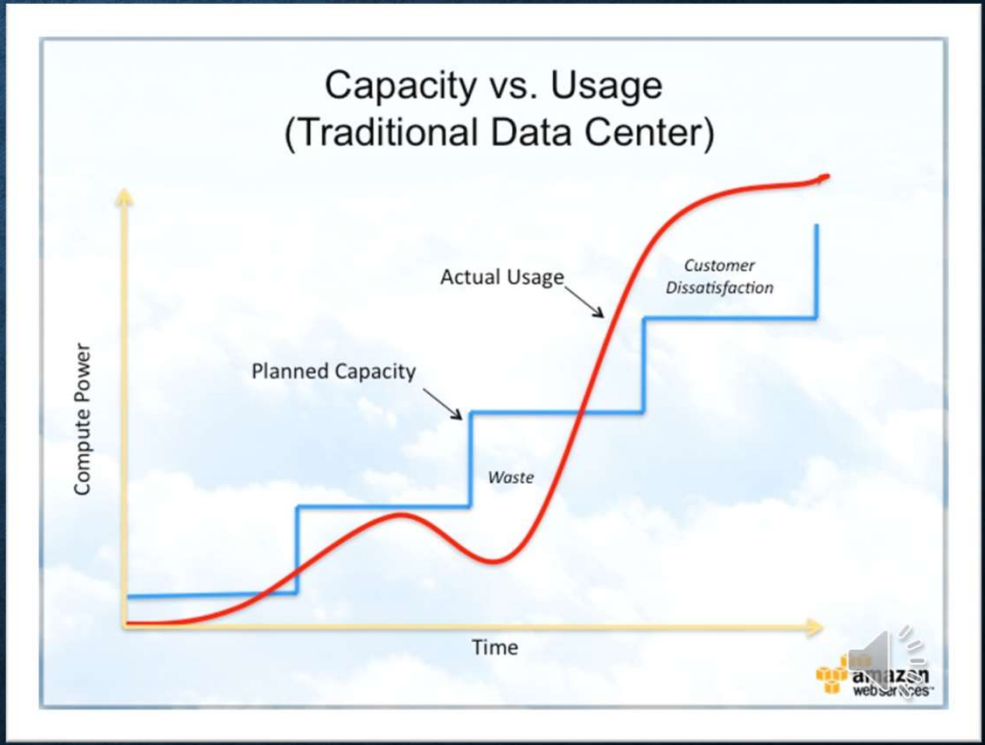
CLOUD-BASED DEVELOPMENT PRINCIPLES

Elasticity:

- Auto-Scaling
- Benefits

Pay-for-Use Model:

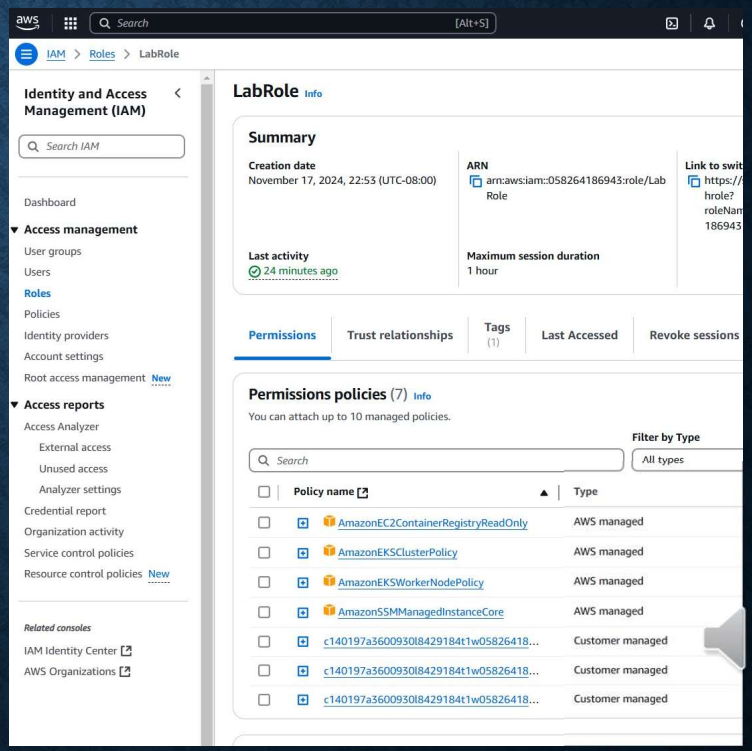
- Pay for what you consume
- Benefits



SECURING YOUR CLOUD APP - ACCESS

How can you prevent unauthorized access?

- Use IAM roles and policies to control access to AWS resources.
- Implement least privilege access to grant only necessary permissions.
- Enable Multi-Factor Authentication (MFA) for critical accounts



SECURING YOUR CLOUD APP - POLICIES

Roles vs Policies

- IAM roles define who can access resources, while policies define what actions they can perform.

```
Custom Policies Created
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "dynamodb:*",
      "Resource": "arn:aws:dynamodb:us-east-1:123456789012:table/Questions"
    }
  ]
}
```

SECURING YOUR CLOUD APP - API SECURITY

- Secure Lambda and API Gateway Connection
- Lambda and the Database
- S3 Bucket

CONCLUSION

So what? Why is this important?

LIFE IS EASIER

SAVES MONEY

MORE SECURE