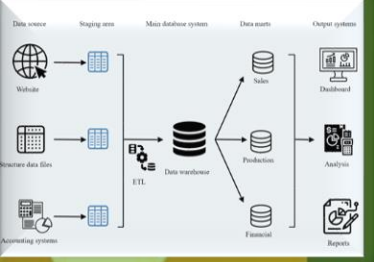

Cloud Solution Architecture Project to Deploy Workloads on AWS

FEB. 15/2023

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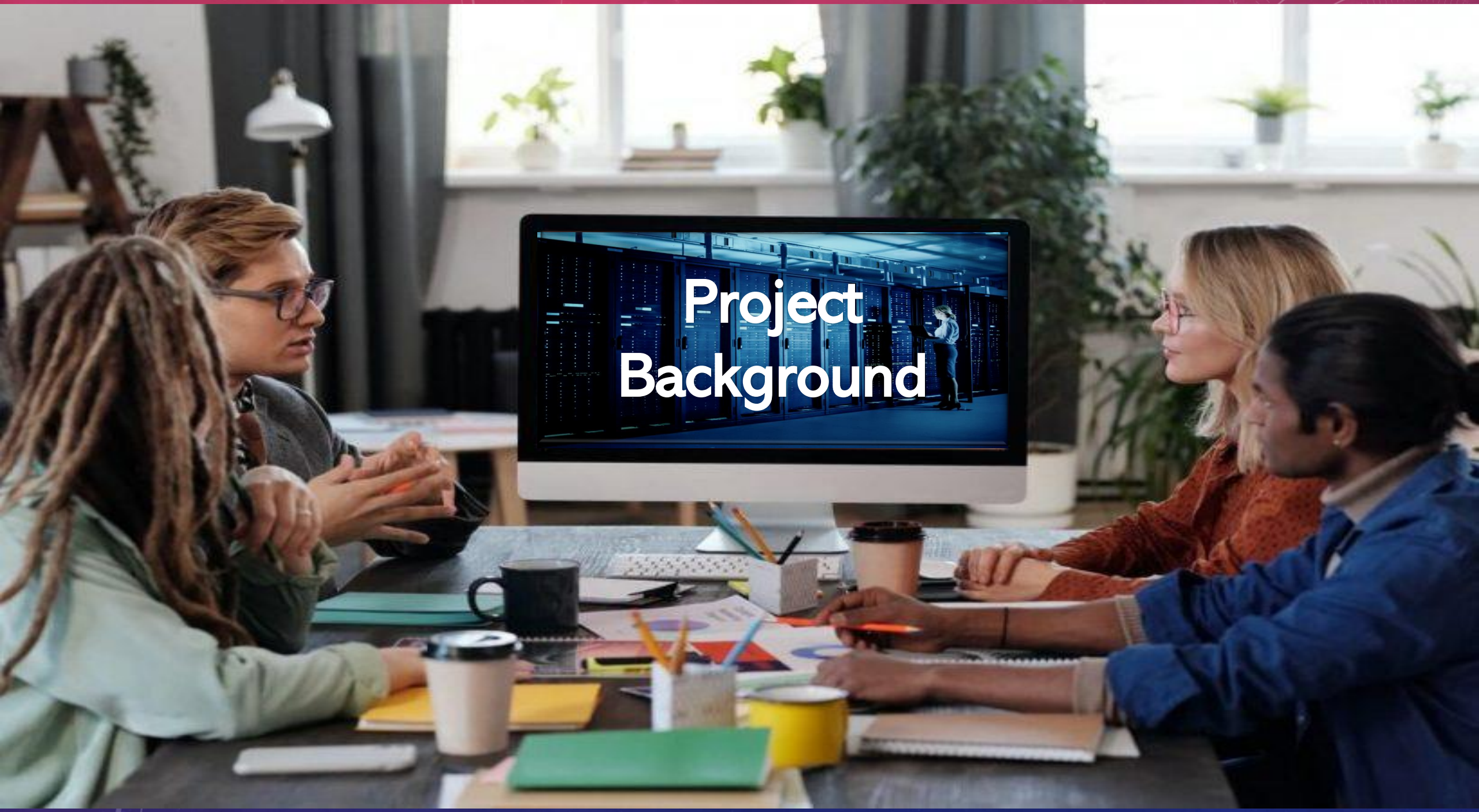

Project
Background

Problem Statement

- I’m working for a customer that runs their workloads on premises. My customer has two workloads:
  - ✓ A three-tier architecture composed of a frontend (HTML, CSS, JavaScript), backend (Apache Web Server and a Java application), and database (MySQL). The three-tier application hosts a dynamic website that accepts user traffic from the internet.
  - ✓ A data analytics workload that runs Apache Hadoop. The analytics workload analyzes a massive amount of data that stored on premises and it also uses visualization tools to derive insights.
- These components are currently running in the data center on physical servers. Currently, if a power outage occurred in the data center, all systems would be brought offline. Because of this issue (in addition to other benefits of the cloud), My customer wants to migrate all components to the cloud and, when possible, use AWS services to replace on-premises components.

What will I do as a Cloud Solutions Architect?

- I have been tasked with designing a solution that uses AWS services to decouple the application layers (frontend, backend, and database), and that hosts both the application and the data analytics workload in the cloud.

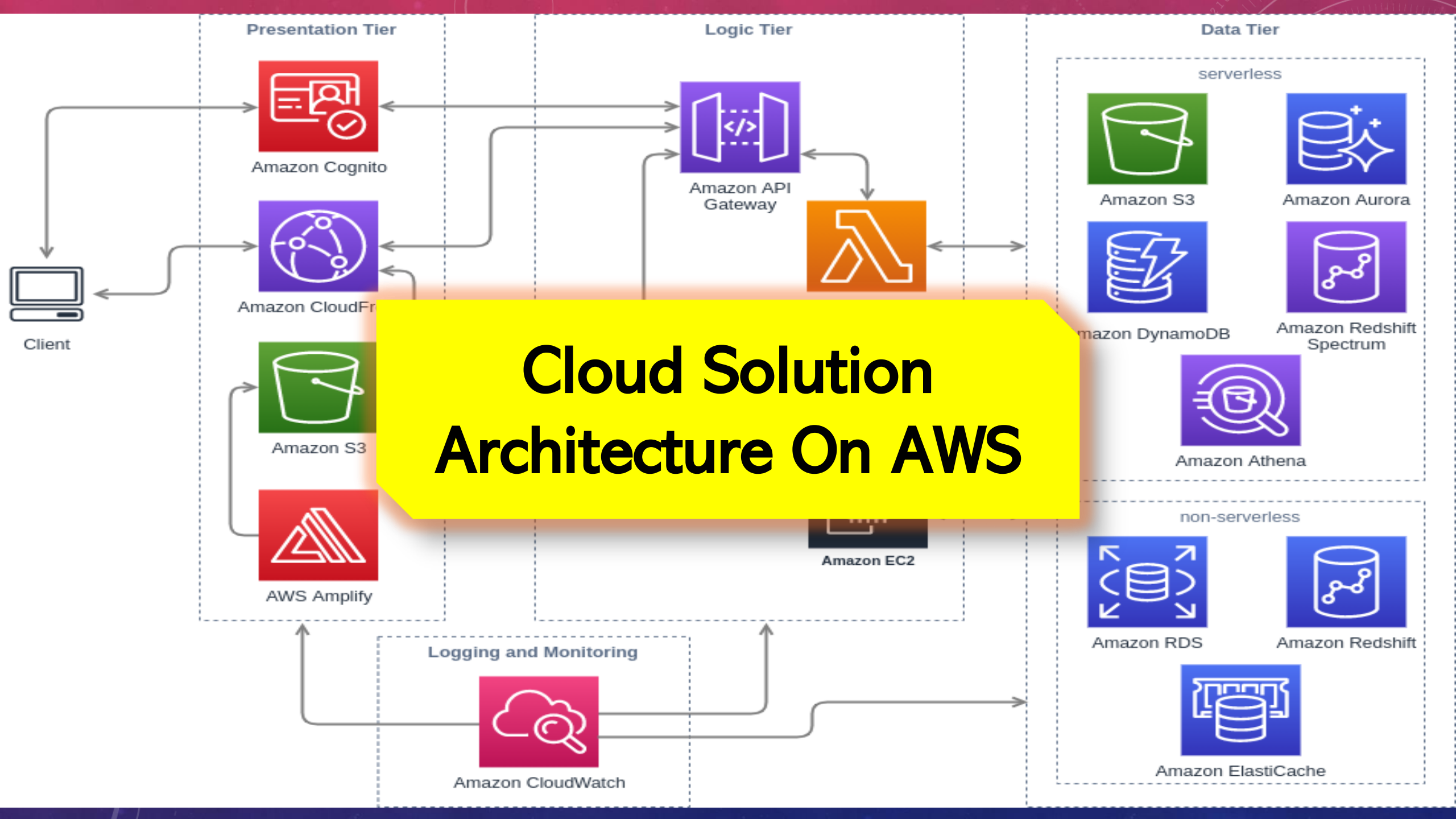
- I can use managed services and advocate for refactoring the code to take advantage of cloud-native technologies, or I can do a lift and shift and advocate for minimal refactoring.

- Also, the data analytics solution currently runs on Hadoop and I have a requirement to spin up an Amazon EMR cluster for it. However, it’s up to me to choose which AWS services I want to use for the ingestion, storage, and visualization of data.


Asking Business Questions?
What, Why and How?

Some Crucial Questions to be answered

- What are the benefits and trade-offs of refactoring the code versus doing a lift and shift?
- How will I ensure high availability, scalability, and security for each application layer?
- Which AWS services will I use to decouple the frontend, backend, and database layers? For example, I may consider using Amazon SQS, Amazon SNS, or Amazon EventBridge for messaging and integration.
- How will I ingest, store, and visualize data for the data analytics workload? For example, I may consider using Amazon Kinesis, Amazon S3, or Amazon QuickSight for these purposes.
- How will I configure and manage the Amazon EMR cluster for running Hadoop? Such as, I may consider using AWS CloudFormation, AWS Auto Scaling, or AWS Glue


Presentation Tier
Logic Tier
Data Tier
Amazon Cognito
Amazon API Gateway
serverless
Amazon S3
Amazon Aurora
Amazon DynamoDB
Amazon Redshift Spectrum
Amazon Athena
Client
Amazon CloudFr
Amazon S3
AWS Amplify
Amazon EC2
non-serverless
Amazon RDS
Amazon Redshift
Amazon ElastiCache
Logging and Monitoring
Amazon CloudWatch
Cloud Solution Architecture On AWS

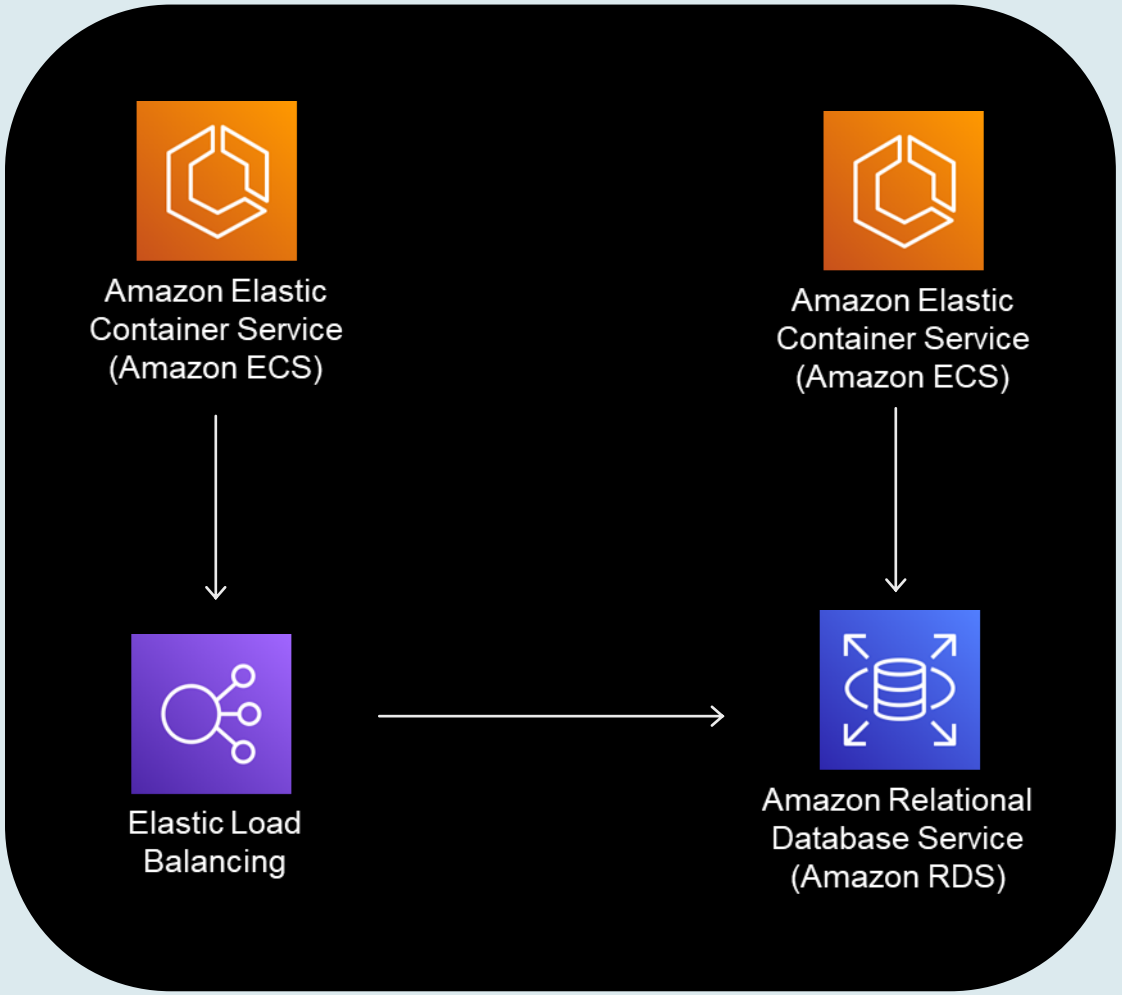
Solution Architecting

- For the three-tier architecture workload, I could use Amazon Elastic Container Service (ECS) to host the frontend and backend components in containers. This would decouple the application layers and allow for easy scaling and management. For the database layer, I could use Amazon RDS for MySQL to host the database.

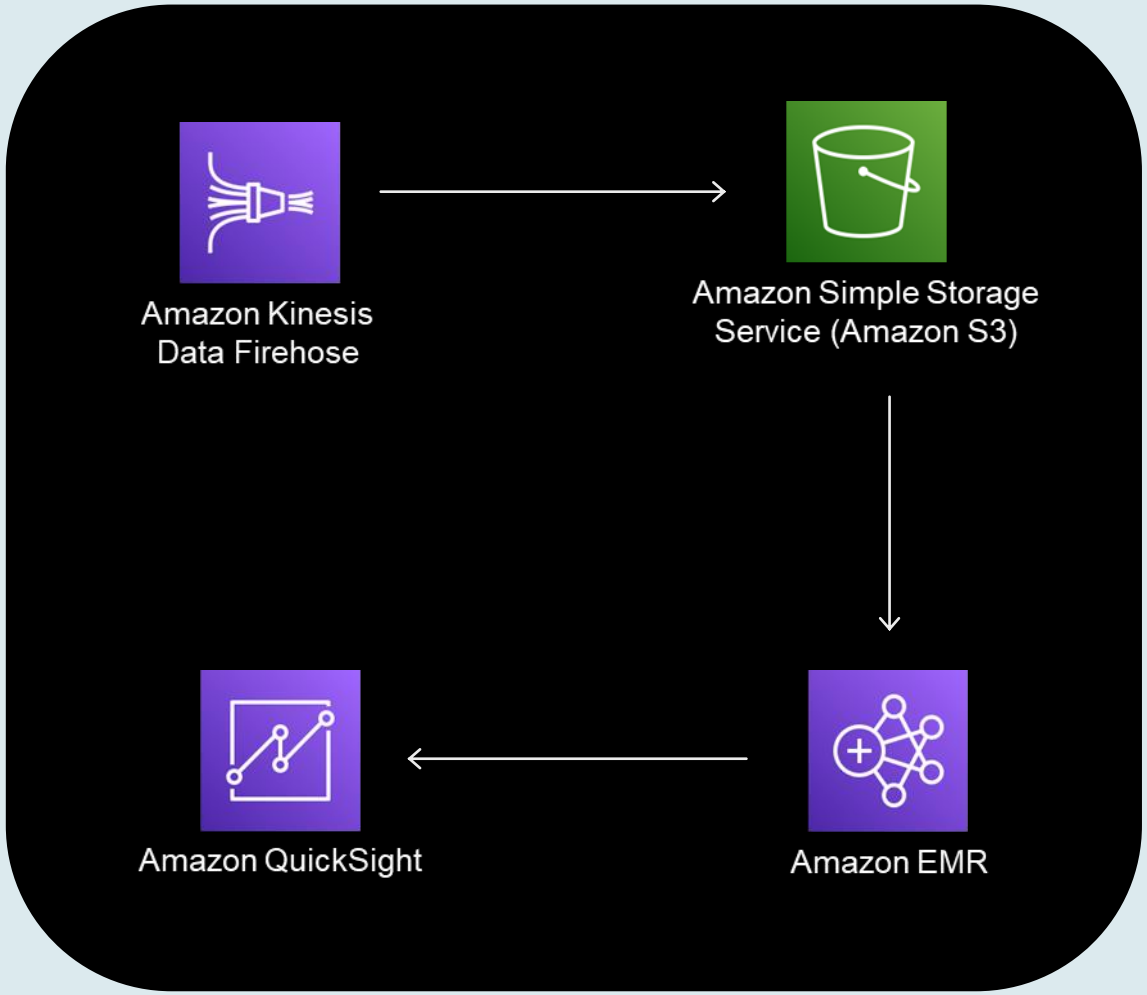
- For the data analytics workload, I could use Amazon Kinesis Data Firehose to ingest data into Amazon S3 for storage. From there, I could spin up an Amazon EMR cluster to run Apache Hadoop and process the data. For visualization, I could use Amazon QuickSight.

- This solution takes advantage of several managed AWS services to reduce management overhead and improve scalability and reliability. The use of containers with ECS allows for easy deployment and scaling of the frontend and backend components. RDS provides a managed database solution with automatic backups and failover capabilities. Kinesis Data Firehose simplifies data ingestion into S3, while EMR provides a managed Hadoop environment. Finally, QuickSight provides an easy-to-use visualization tool.

Cloud Solutions Architecture on AWS



Three-Tier Architecture Workload



Data Analytics Workload

Why I Choose Those Specific AWS Tools for SA

- **Frontend (ECS)**: Amazon Elastic Container Service (ECS) is a fully managed container orchestration service that makes it easy to deploy, manage, and scale containerized applications. Using containers allows for easy decoupling of the application layers and provides flexibility in deployment and scaling.

- **Backend (ECS)**: Similarly to the frontend component, ECS was also chosen to host the backend component in containers for the same reasons.

- **Elastic Load Balancer**: A load balancer was included in the architecture to distribute incoming traffic across multiple frontend instances. This improves availability and fault tolerance.

- **RDS (MySQL)**: Amazon RDS for MySQL was chosen to host the database layer. RDS is a fully managed relational database service that provides cost-efficient and resizable capacity while automating time-consuming administration tasks such as hardware provisioning, database setup, patching, and backups. Using RDS simplifies database management and provides features such as automatic failover and read replicas.

Cont…

- **Kinesis Data Firehose**: was chosen for data ingestion into S3. It is a fully managed service that makes it easy to capture, transform, and load streaming data into data lakes, data stores, and analytics services. It can automatically scale to match the throughput of data and requires no ongoing administration.

- **S3 (Storage)**: Amazon S3 was chosen for data storage due to its durability, availability, scalability, and security. S3 provides object storage with a simple web service interface to store and retrieve any amount of data from anywhere on the web.

- **EMR (Hadoop)**: Amazon EMR was chosen to run Apache Hadoop for processing the data stored in S3. EMR is a managed cluster platform that simplifies running big data frameworks such as Apache Hadoop by providing pre-configured environments with optimized configurations.

- **QuickSight** (Visualization): Due to its ease-of-use and integration with other AWS services such as S3 and EMR. QuickSight is a fast business analytics service that makes it easy to build visualizations, perform ad-hoc analysis, and quickly get business insights.


Achievements &
Recommendations

Achievements

- Designed a scalable and decoupled cloud solution using AWS services such as EC2, S3, Lambda, API Gateway, DynamoDB, EMR, Kinesis, Glue, Athena and QuickSight.
- Migrated the application and data analytics workloads from on-premises to AWS with minimal downtime and disruption.
- Refactored the application code to leverage serverless technologies and microservices architecture for improved performance and cost-efficiency.
- Implemented security best practices such as encryption at rest and in transit, IAM policies and roles, VPCs and security groups.
- Enabled data ingestion, storage and visualization using a combination of streaming and batch processing methods for real-time and historical insights.

Recommendations

- Monitor and optimize the cloud solution using AWS CloudFormation, CloudWatch, CloudTrail and Trusted Advisor.
- Explore other AWS services that can enhance the functionality and user experience of the application such as Cognito, Amplify, AppSync etc.
- Implement backup and disaster recovery strategies using AWS Backup, S3 Glacier etc.
- Adopt a DevOps culture using AWS CodeCommit, CodeBuild , CodeDeploy , CodePipeline etc.

Reference

- **AWS- Cloud Solutions Architect Specializations Professional Certificate**

  - ✓ **Visit My GitHub Portfolio**: https://github.com/kedibeki
  - ✓ **Visit the Specializations Page**: https://www.coursera.org/professional-certificates/aws-cloud-solutions-architect
  - ✓ **AWS Training & Certification**: https://www.aws.training

Acknowledgment

- **AWS (Amazon Web Services) and Coursera- AWS Cloud Solutions Architect Specializations Instructors**

  - ✓ **Morgan Willis**: Senior Cloud Technologist @AWS Training & Certification
  - ✓ **Rafael Lopes**: Principal Cloud Technologist @AWS Training & Certification
  - ✓ **Seph Robinson**: Cloud Technologist @AWS Training and Certification
  - ✓ **Alana Layton**: Technical Curriculum Developer

"DESIGN AND IMPLEMENT YOUR COMPANY'S COMPUTING NEEDS ON THE CLOUD. OPTIMIZE YOUR PERFORMANCE, REDUCE COSTS, OR ENHANCE SECURITY. ASSISTING YOU WITH FINDING THE BEST SOLUTIONS FOR YOUR BUSINESS PROBLEMS!"

THANK YOU!