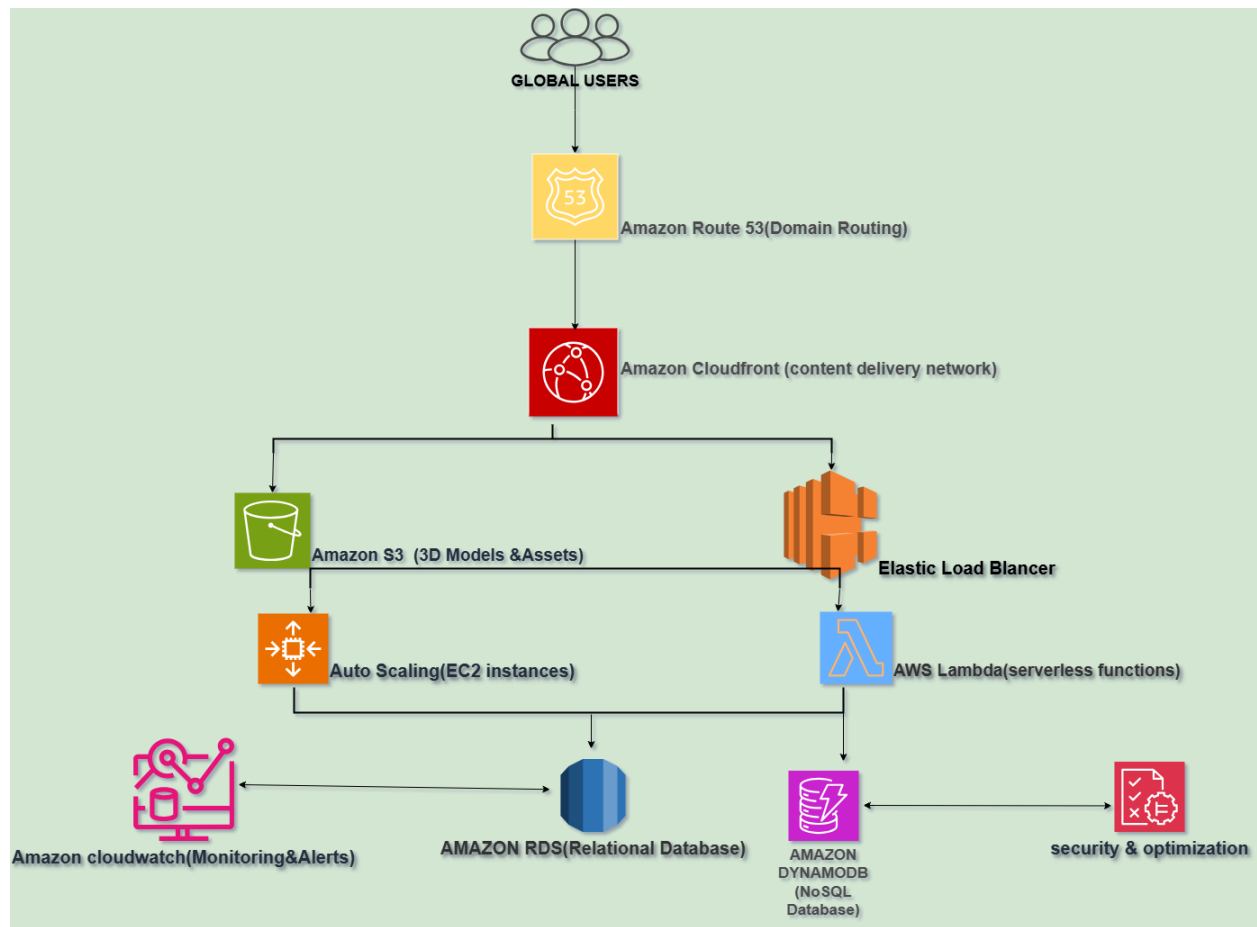# 3D E-Commerce Platform Architecture Project

Introduction

This project presents the design of a next-generation 3D e-commerce web application hosted on Amazon Web Services (AWS). The platform enables customers to interact with high quality 3D models of products such as furniture, gadgets, and fashion items before making purchasing decisions.The solution is designed to support millions of global users while ensuring high availability, scalability, performance, security, and cost efficiency.

Requirements

The startup requires the cloud architecture to meet the following objectives:

- 24/7 high availability

- Global low-latency access

- Support for unpredictable traffic spikes

- Secure handling of customer and product data

- Cost-effective resource management

- Fast rendering and delivery of 3D content

Architecture Components

The platform uses **Amazon Route 53** for DNS management and global traffic routing, This ensures that users from different geographical regions are directed efficiently. Health checks are configured to monitor application endpoints. If a failure occurs in one region, traffic can automatically be redirected to a healthy region. This design improves availability and supports disaster recovery strategies.

Amazon CloudFront is used as a Content Delivery Network (CDN).

Purpose:

- Distributes 3D models and static content globally

- Reduces latency

- Caches frequently accessed files

- Minimizes backend load.
  This ensures smooth 3D product interaction and fast page loading.

Object Storage for 3D Assets

Amazon S3 stores:

- 3D model files (.glb, .gltf)

- Images

- JavaScript/CSS files

- Static web content

Key Features Enabled:

- Versioning

- Lifecycle policies

- Encryption at rest

- Intelligent-Tiering for cost optimization.
  S3 provides 99.999999999% durability, making it ideal for large digital assets.

Application Layer

The backend application runs on Amazon EC2 and Elastic Load Balancing .EC2 instances are placed in an Auto Scaling Group across multiple Availability Zones. Benefits are, Automatic scaling during traffic spikes, Fault tolerance,Load distribution,No single point of failure.
This ensures consistent performance even during peak shopping periods.

The architecture uses two database solutions:

Relational Database

Amazon RDS

Stores:

- Orders

- Payments

- Customer accounts

Enabled with:

- Multi-AZ deployment

- Automated backups

- Encryption

NoSQL Database

Amazon DynamoDB

Stores:

- Product catalog

- User sessions

- High-speed lookups

DynamoDB provides single-digit millisecond latency and automatic scaling

Monitoring and Optimization

System performance and health are monitored using:

- Amazon CloudWatch

CloudWatch tracks:

- CPU usage

- Memory utilization

- Network traffic

- Database performance

- Application errors

Cost and performance recommendations are provided by AWS Trusted Advisor.

High Availability Strategy

The architecture ensures 24/7 availability through:

- Multi-AZ EC2 deployment

- Multi-AZ RDS configuration

- CloudFront global edge locations

- Route 53 health checks and failover

- Auto Scaling Groups.
  This eliminates single points of failure.

Scalability Design

The system handles unpredictable traffic using:

- Auto Scaling Groups

- Elastic Load Balancing

- Serverless Lambda functions

- DynamoDB on-demand scaling

This ensures the platform automatically adjusts to traffic demands.

Security Implementation

Security follows AWS best practices:

- IAM roles with least privilege access

- Security Groups and NACLs

- HTTPS encryption (SSL/TLS)

- Data encryption at rest and in transit

- Web Application Firewall (WAF) protection

- Regular monitoring and alerts

These measures protect customer data and prevent unauthorized access.

Performance Optimization

Performance is achieved through:

- CloudFront caching

- S3 static content hosting

- Load balancing

- Database read replicas

- Auto scaling policies

Users experience smooth 3D product rendering and fast page loads globally.

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9. Cost Optimization Strategy

The architecture avoids over-provisioning by using:

- Auto Scaling

- Serverless compute (Lambda)

- S3 lifecycle policies

- Intelligent-Tiering storage

- CloudWatch monitoring

- Trusted Advisor recommendations

This ensures efficient resource utilization and reduced operational costs

Conclusion

The proposed AWS architecture successfully meets all business and technical requirements of the 3D e-commerce platform.

It delivers:

- High availability through multi-AZ deployment

- Scalability through auto scaling and serverless technologies

- Performance through global content delivery

- Security through IAM, encryption, and monitoring

- Cost efficiency through managed services and optimization tools

This solution provides a strong foundation for a globally scalable, secure, and high-performance 3D e-commerce platform capable of supporting millions of users.