

Cloud-Based Digital Signage Solution with AWS Elemental MediaLive

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1. Introduction

Overview of the Project

The Cloud-Based Digital Signage Solution using AWS Elemental MediaLive is designed to deliver real-time multimedia content across various industries, including retail, healthcare, education, and entertainment. This project leverages AWS services to provide a scalable, secure, and efficient platform for managing and streaming digital signage. AWS Elemental MediaLive offers live video encoding, enabling high-quality broadcasts to multiple devices. The solution improves operational efficiency through remote content management, dynamic scheduling, and real-time analytics. By using AWS cloud infrastructure, organizations can reduce costs, enhance audience engagement, and maintain a robust, scalable digital signage network.

AWS Services Being Used and Justification

- **AWS Elemental MediaLive:** For real-time video encoding and live streaming.
- **AWS Elemental MediaPackage:** Packages video streams to support adaptive bitrate streaming for multiple devices.
- **Amazon CloudFront:** Distributes content globally with low latency, ensuring seamless access.
- **Amazon S3:** Stores pre-recorded content and metadata securely.
- **AWS Lambda:** Automates content updates and scheduling for efficient management.
- **Amazon DynamoDB:** Manages metadata, schedules, and analytics for better operational insights.

These services work together to deliver a comprehensive, scalable, and automated digital signage solution while ensuring reliability and real-time performance.

Project Purpose and Expected Outcome

The project aims to create a cloud-based digital signage system using AWS Elemental MediaLive for real-time streaming and content management. The expected outcome is a robust, scalable solution that enables remote content control, dynamic scheduling, and enhanced viewer engagement across multiple industries.

2. Methodology

Architecture and Workflow

The architecture involves integrating AWS Elemental MediaLive for real-time video encoding, MediaPackage for adaptive bitrate streaming, and CloudFront for global content delivery. Content is stored in Amazon S3, while AWS Lambda automates scheduling and updates. Amazon DynamoDB handles metadata and analytics. This workflow allows seamless content creation, encoding, distribution, and management.

The process begins with ingesting live video through AWS Elemental MediaLive. MediaPackage formats the stream for various devices, and CloudFront ensures low-latency delivery. Pre-recorded content is stored in S3, with automated updates triggered by Lambda functions. DynamoDB manages scheduling and analytics to monitor system performance and viewer engagement.

Explanation of AWS Services Interaction

AWS Elemental MediaLive captures live video, encodes it, and sends it to AWS Elemental MediaPackage, which formats it for adaptive streaming. MediaPackage ensures that videos are compatible with multiple devices and supports failover mechanisms.

Amazon CloudFront distributes both live and pre-recorded content globally with low latency. Amazon S3 acts as a centralized repository for content storage. AWS Lambda triggers automated workflows, updating content and managing schedules. Amazon DynamoDB stores essential metadata, schedules, and analytical data to monitor and enhance system operations. Together, these services form a cohesive system to deliver, manage, and analyze digital signage content.

Justification for AWS Service Selection

AWS services were selected for their scalability, reliability, and seamless integration capabilities. AWS Elemental MediaLive ensures broadcast-quality encoding, MediaPackage supports multi-device delivery, and CloudFront guarantees fast, global distribution. The combination of S3, Lambda, and DynamoDB facilitates automation, content management, and analytics, enhancing operational efficiency and reducing maintenance overhead.

3. Implementation Steps

AWS Infrastructure Setup

1. **Provision AWS Elemental MediaLive:** Create live channels for video ingestion and encoding.
2. **Configure AWS Elemental MediaPackage:** Set up packaging groups for adaptive bitrate streaming.
3. **Deploy Amazon CloudFront:** Distribute content globally with low-latency caching.
4. **Set Up Amazon S3:** Establish storage buckets for pre-recorded content and metadata.
5. **Integrate AWS Lambda:** Automate content updates and scheduling.
6. **Initialize Amazon DynamoDB:** Store metadata, content schedules, and analytics.

This infrastructure provides a scalable, secure environment for digital signage, allowing automated workflows and real-time content delivery.

Security Policies, IAM Roles, and Access Controls

1. **IAM Roles and Policies:**
 - Create a MediaLive role for channel management.
 - Assign Lambda permissions to access S3 and DynamoDB.
 - Configure CloudFront OAI for secure content delivery from S3.
2. **Access Control:**
 - Implement fine-grained permissions to limit access.
 - Use AWS Secrets Manager to manage sensitive credentials.
3. **Data Encryption:**
 - Enable server-side encryption on S3.
 - Use HTTPS for all data transfers via CloudFront.

By applying these policies, the project ensures data integrity, confidentiality, and controlled access across services.

Automation and CI/CD Pipeline

Automation is achieved using AWS Lambda to update content dynamically and trigger workflows. A CI/CD pipeline can be implemented using AWS CodePipeline and AWS CodeBuild to automate the deployment of infrastructure and application updates.

1. **Source Control:** Store infrastructure code in a Git repository.
2. **Build and Test:** Use CodeBuild for automated testing.
3. **Deploy:** Employ CodePipeline to automate deployment to AWS services.

This approach ensures consistent, repeatable deployments while enabling rapid updates to the digital signage system with minimal downtime.