Serverless Image / Video Processing using AWS

1. Project Overview

Project Title: Serverless Image & Video Processing Pipeline
Architecture Type: Event-Driven Serverless Architecture

Goal

Automatically process images or videos uploaded to Amazon S3. Processing includes:

- Image resizing (Lambda)
- Label detection (Amazon Rekognition)
- Notification after processing (Amazon SNS)

AWS Services Used

- **Amazon S3** – Storage and event trigger
- **AWS Lambda** – Image processing & Rekognition calls
- **AWS Step Functions** – Orchestration of workflow
- **Amazon Rekognition** – Image/Video label detection
- **Amazon SNS** – Notifications
- **IAM** – Permissions and security

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2. High-Level Architecture Flow

1. User uploads an image/video to S3 bucket
2. S3 event triggers Step Functions
3. Step Functions invokes Lambda functions sequentially
4. Lambda resizes image / processes video
5. Lambda calls Rekognition for label detection
6. Results are sent via SNS notification

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3. Step-by-Step AWS Console Setup

Step 1: Create S3 Buckets

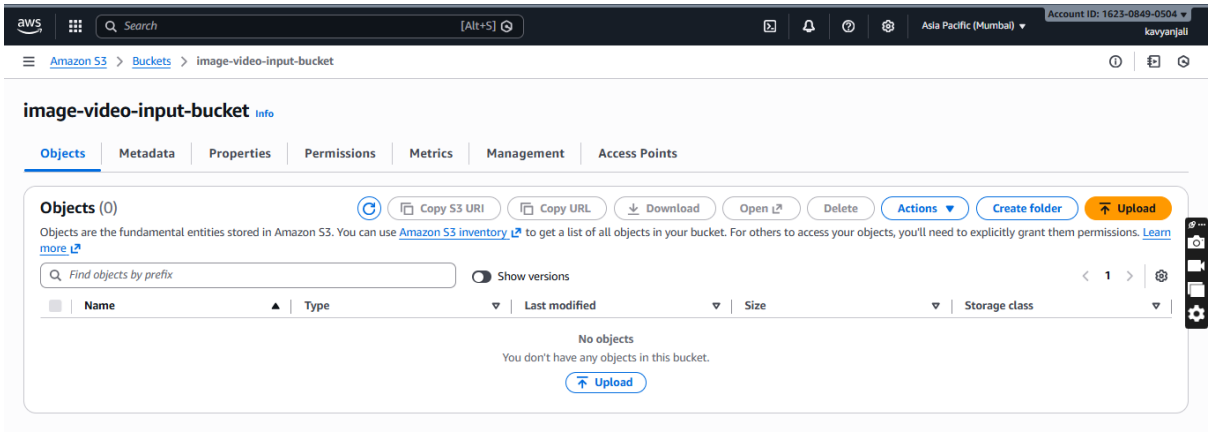
1.1 Create Input Bucket

1. Open **AWS Console → S3 → Create bucket**
2. Bucket name: image-video-input-bucket-<unique>
3. Region: Same region for all services
4. Block all public access → **Enabled**
5. Click **Create bucket**

1.2 Create Output Bucket

1. Click **Create bucket**
2. Bucket name: image-video-output-bucket-<unique>
3. Keep default settings

4. Click **Create bucket**

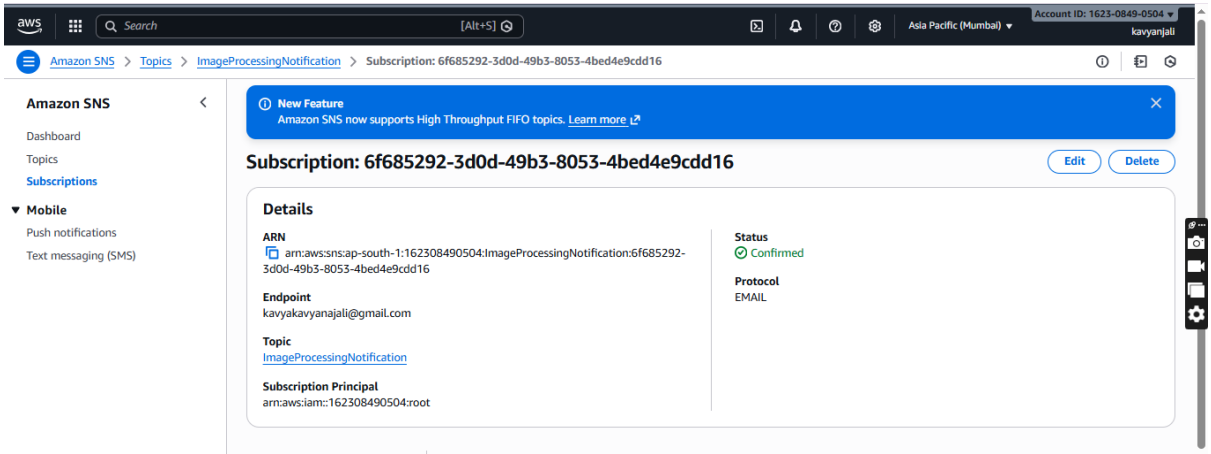


Step 2: Create SNS Topic

1. Go to **SNS → Topics → Create topic**
2. Type: **Standard**
3. Name: ImageProcessingNotification
4. Click **Create topic**

Subscribe Email

1. Open topic → **Create subscription**
2. Protocol: **Email**
3. Endpoint: Your email address
4. Confirm subscription from email

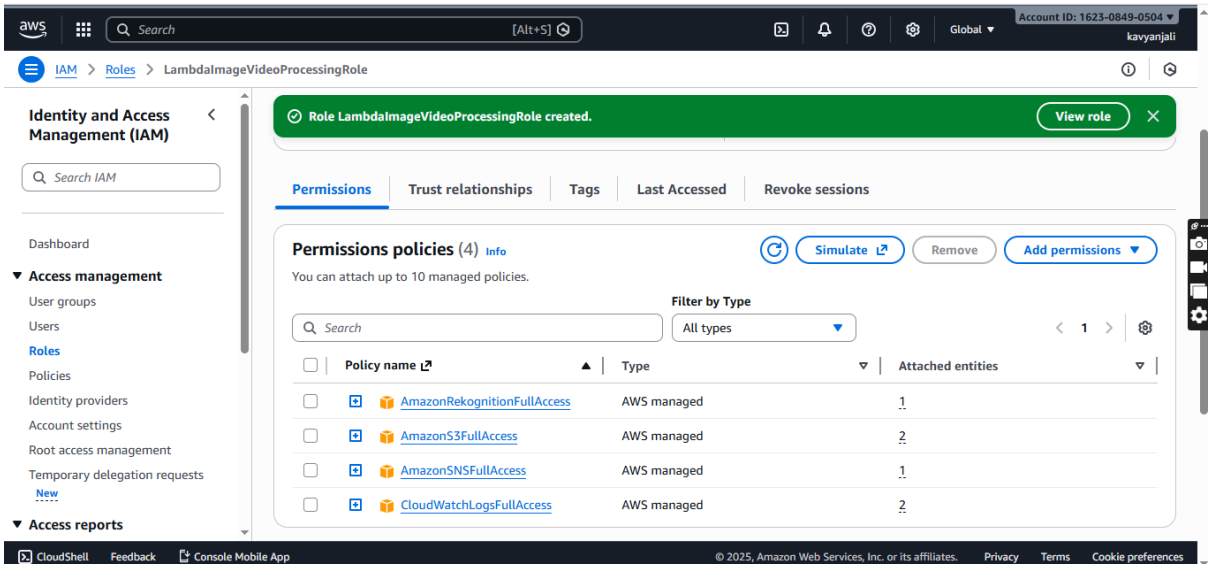


Step 3: Create IAM Role for Lambda

1. Go to **IAM → Roles → Create role**
2. Trusted entity: **AWS service**
3. Use case: **Lambda**
4. Attach policies:
    - AmazonS3FullAccess

- AmazonRekognitionFullAccess
- AmazonSNSFullAccess
- CloudWatchLogsFullAccess

5. Role name: LambdaImageVideoProcessingRole
6. Click **Create role**

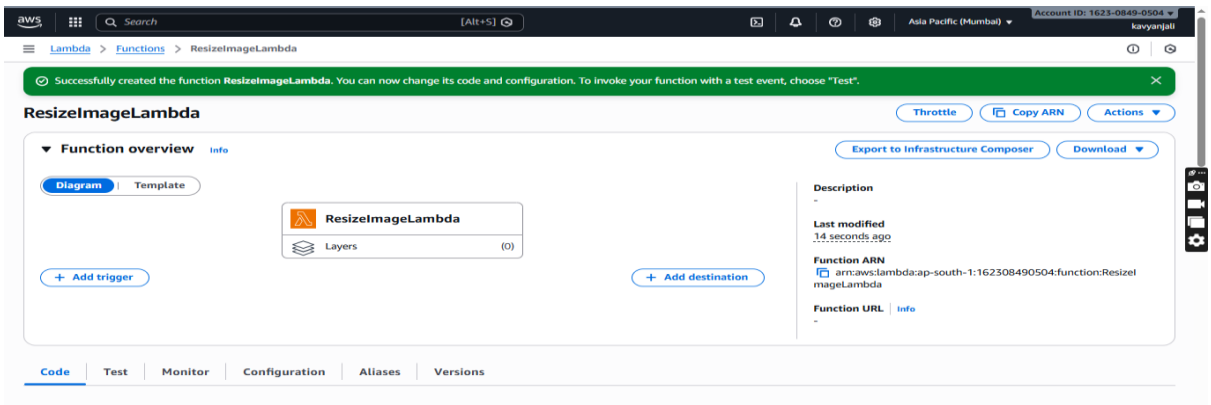


Step 4: Create Lambda Function – Image Resize

1. Go to **Lambda → Create function**
2. Author from scratch
3. Function name: ResizeImageLambda
4. Runtime: **Python 3.12**
5. Execution role: Use existing role
6. Select: LambdaImageVideoProcessingRole
7. Click **Create function**

Sample Logic (Concept)

- Read image from input S3 bucket
- Resize image
- Save resized image to output bucket

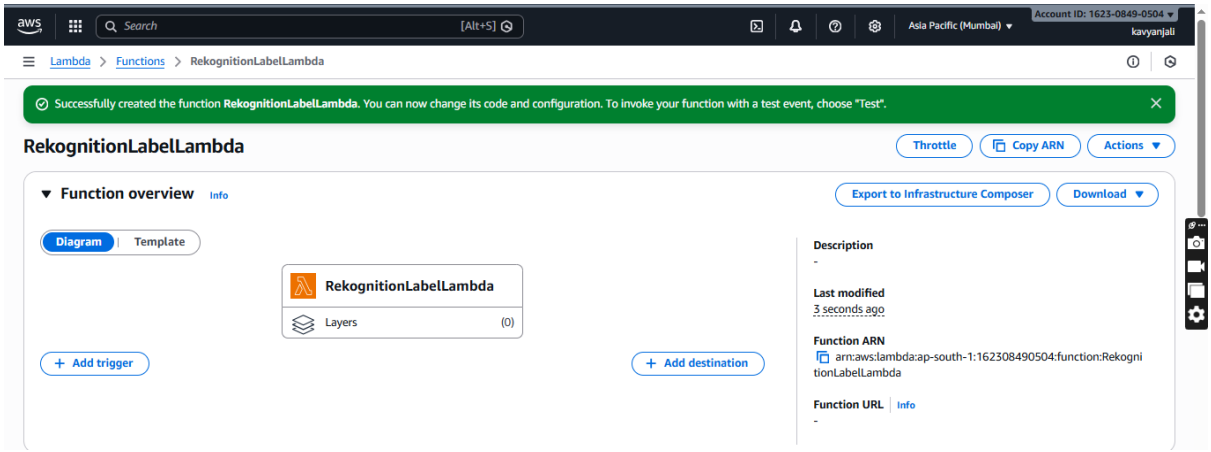


Step 5: Create Lambda Function – Rekognition Labels

1. Create another Lambda function
2. Function name: RekognitionLabelLambda
3. Runtime: Python 3.12
4. Role: LambdaImageVideoProcessingRole

Function Responsibility

- Receive S3 object details
- Call Amazon Rekognition detect_labels
- Store labels in output bucket
- Publish message to SNS



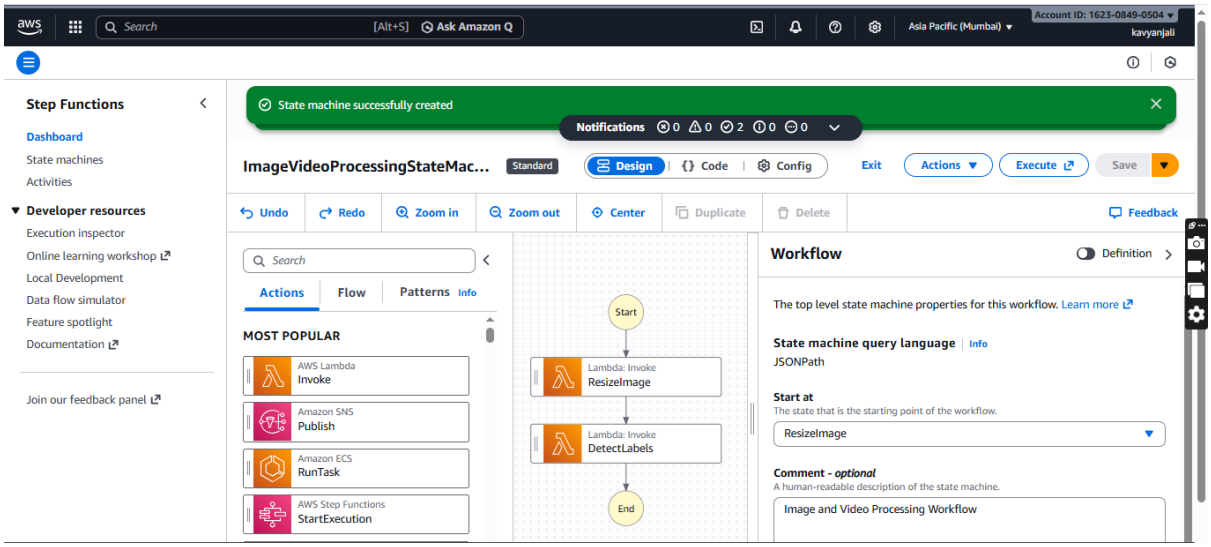
Step 6: Create Step Functions State Machine

1. Go to **AWS Step Functions → State machines → Create state machine**
2. Type: **Standard**
3. Choose **Author with code**

Example Workflow

- Step 1: Resize Image Lambda
- Step 2: Rekognition Label Detection Lambda
- Step 3: SNS Notification

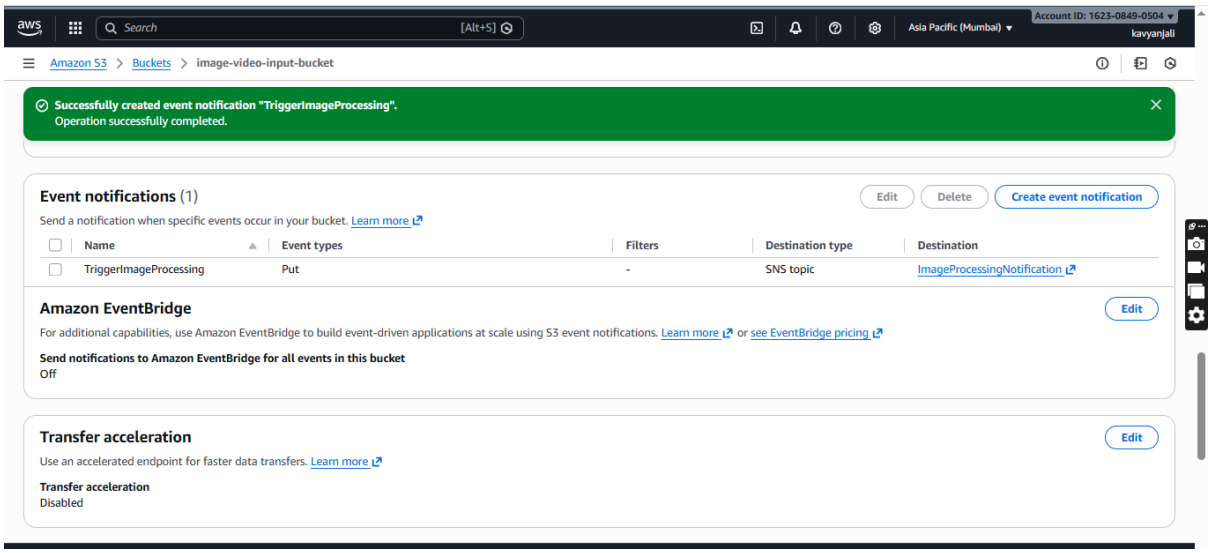
4. Execution role: Create new role
5. Name: ImageVideoProcessingStateMachine
6. Click **Create state machine**



Step 7: Configure S3 Event Trigger

Option A: Using Lambda Trigger

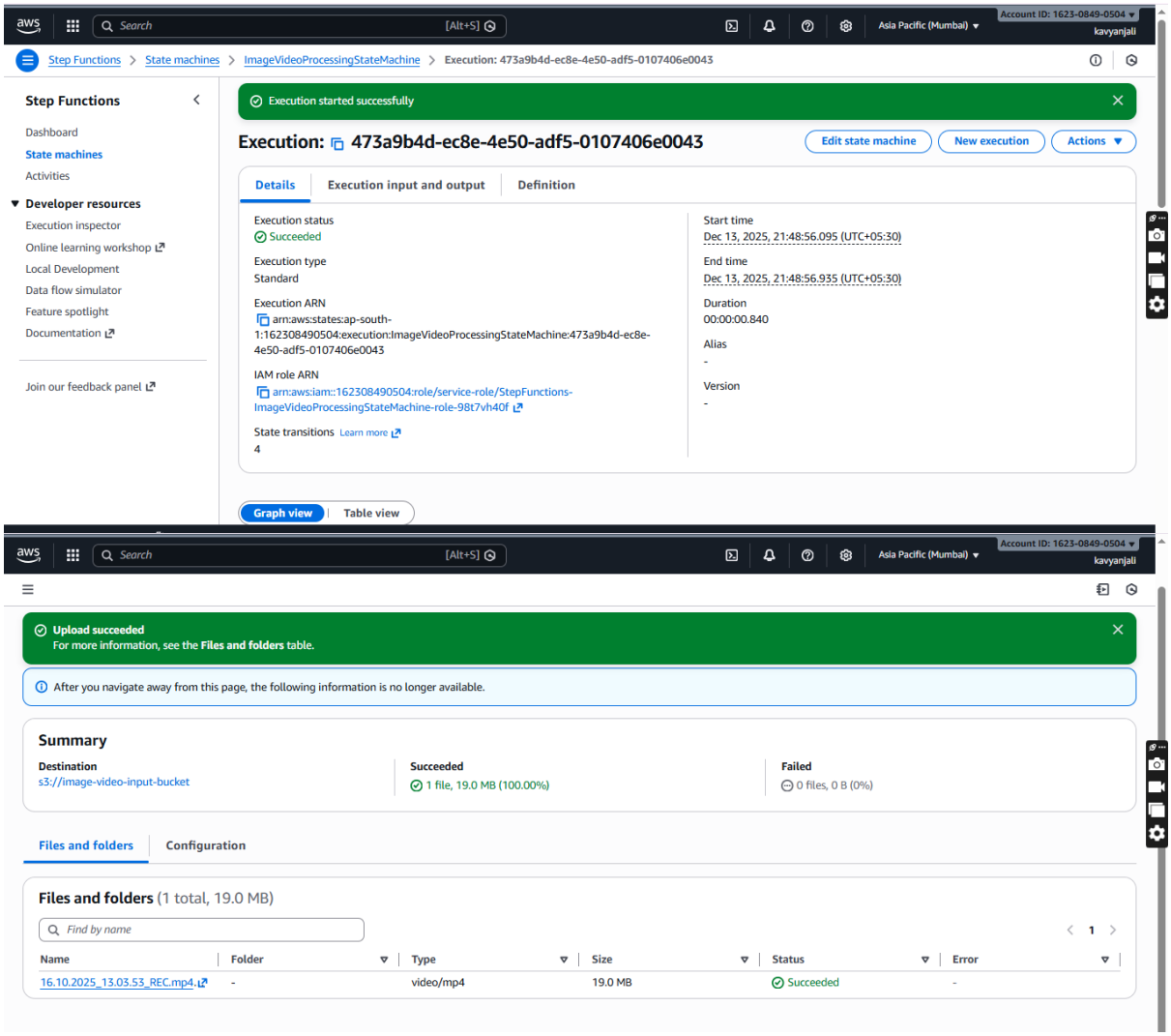
1. Go to **S3 → Input bucket → Properties**
2. Scroll to **Event notifications**
3. Create event notification
4. Event type: **PUT**
5. Destination: **Step Functions**
6. Select state machine



Step 8: Test the Workflow

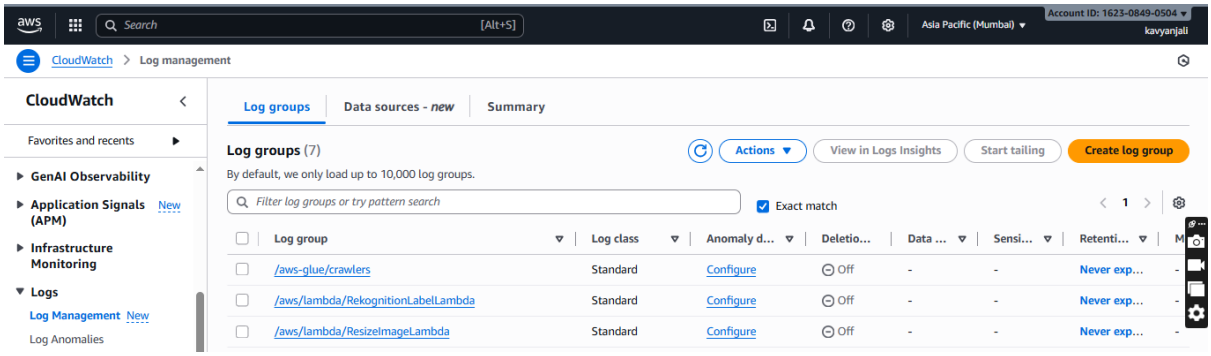
1. Upload an image or video to input bucket
2. Open **Step Functions → Executions**
3. Monitor workflow progress
4. Check output bucket for processed files

5. Verify email notification



9. Monitoring & Logging

- **CloudWatch Logs** for Lambda execution
- **Step Functions Execution History**
- **S3 access logs (optional)**
- **Check logs for: ResizeImageLambda,RekognitionLabelLambda**



10. Security Best Practices

- Use least-privilege IAM policies
- Keep S3 buckets private
- Enable encryption at rest
- Enable CloudTrail for auditing

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11. Skills Demonstrated

- Serverless Architecture
- Event-driven systems
- AWS Lambda orchestration
- Image & video processing
- AWS Rekognition integration
- Monitoring and notifications

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12. Conclusion

This project demonstrates a complete serverless image/video processing pipeline using AWS managed services. It is scalable, cost-effective, and requires no server management, making it ideal for real-time media processing applications.