

AI-Powered Video Summarization and Multilingual Narration Using Google Cloud Platform APIs and Camunda Workflow Automation

Abstract:

This project presents an end-to-end, fully automated Video Summarization and Multilingual Narration System, built using Java, integrated with Camunda Workflow Platform, and powered by a suite of Google Cloud Platform (GCP) AI Services. It is designed to showcase advanced cloud-native capabilities for intelligent media processing and is part of a broader academic and professional contribution aligned with NIW and IEEE publication objectives.

The solution starts by programmatically validating whether the following GCP services are enabled for a given service account:

**storage.googleapis.com (Cloud Storage),
videointelligence.googleapis.com (Video Intelligence API),
aiplatform.googleapis.com (Vertex AI),
translate.googleapis.com (Cloud Translation API),
speech.googleapis.com (Text-to-Speech API).**

This verification is achieved using the **Service Usage API**, and appropriate user-friendly messages are displayed if any APIs are not enabled or if the service account lacks the required IAM permissions (such as **roles/serviceusage.viewer**). Upon passing this validation stage, the application follows a Camunda-driven service task workflow that initiates the main logic. The system prompts the user to provide a local video file, which is uploaded to a preconfigured Cloud Storage bucket. The available target languages are then listed, and the user selects a preferred language for summarization and narration.

The processing pipeline includes:

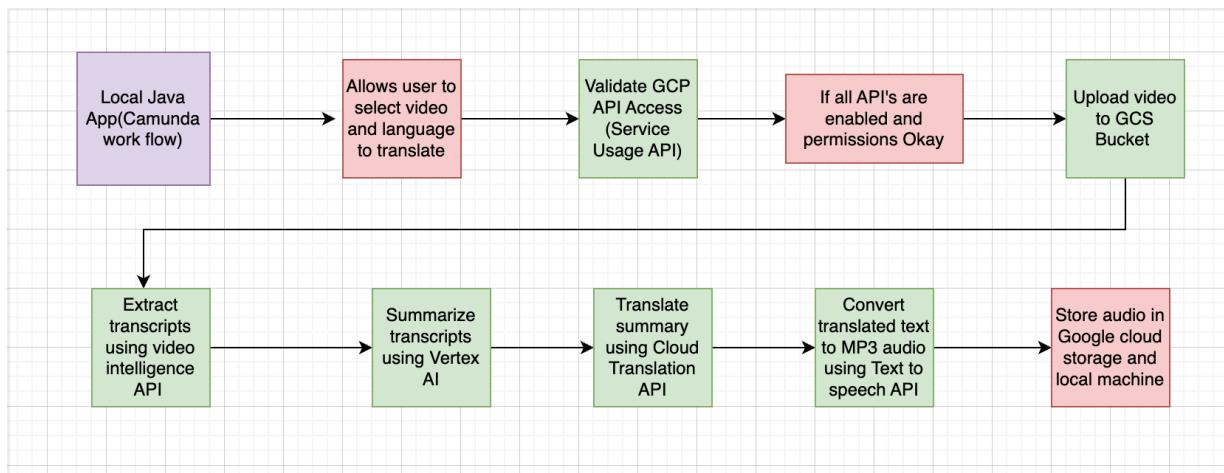
**Video Intelligence API – extracts full transcripts from the video.
Vertex AI (Gemini model) – performs intelligent summarization of the transcripts.
Cloud Translation API – translates the summary into the user-selected language.
Text-to-Speech API – generates high-quality audio narration in the target language.**

The final narrated .mp3 file is stored both in the GCS bucket and on the local machine for convenient access.

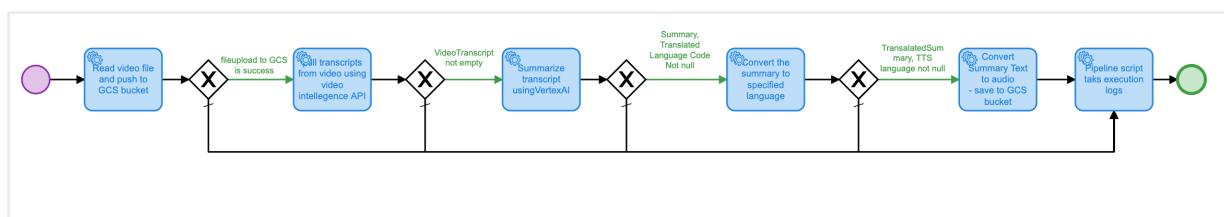
This robust Java-based architecture enforces IAM-driven role validation (e.g., roles/storage.admin, roles/ aiplatform.user, roles/ clodtranslate.user) and guides the user in configuring essential properties such as the **service account file**, **project ID**, and **bucket name via constants in the ApplicationConstants interface**.

The application embodies the fusion of cloud AI, workflow automation, and language accessibility — a powerful combination demonstrating how cloud-native design can be harnessed to solve real-world multimedia challenges at scale.

Architecture:



Camunda Workflow:



Setup Instructions:

Create a service account and provide below roles

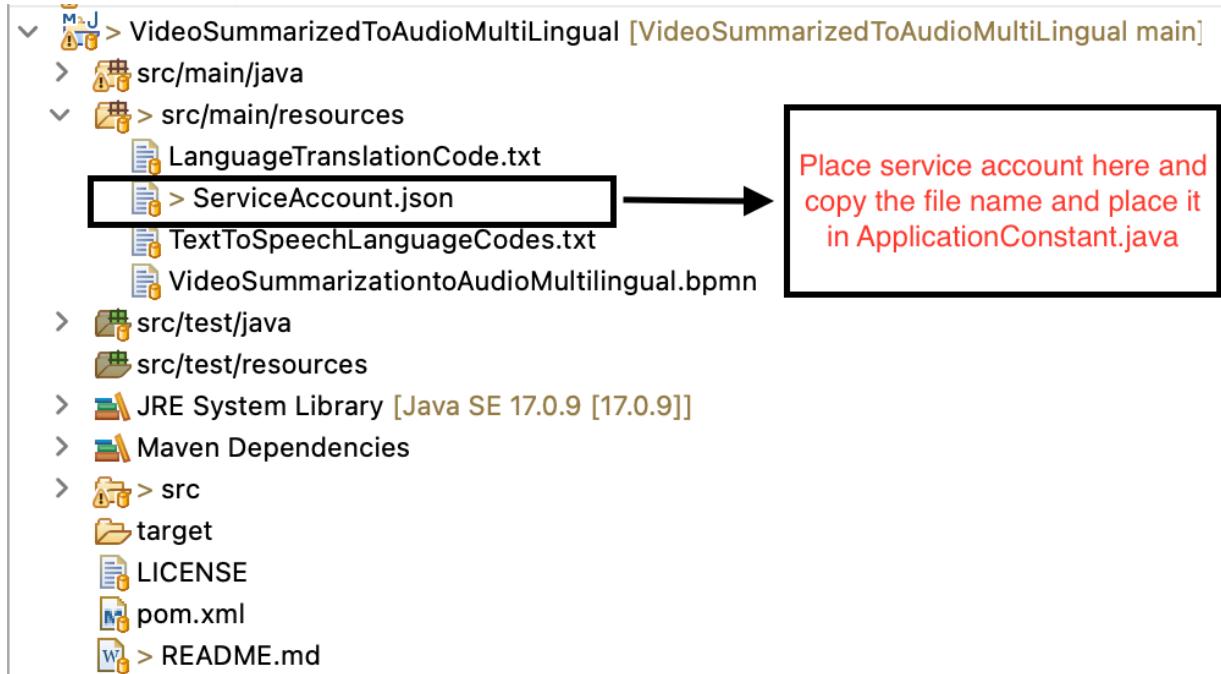
Assign roles

Roles are composed of sets of permissions and determine what the principal can do with this resource. [Learn more](#)

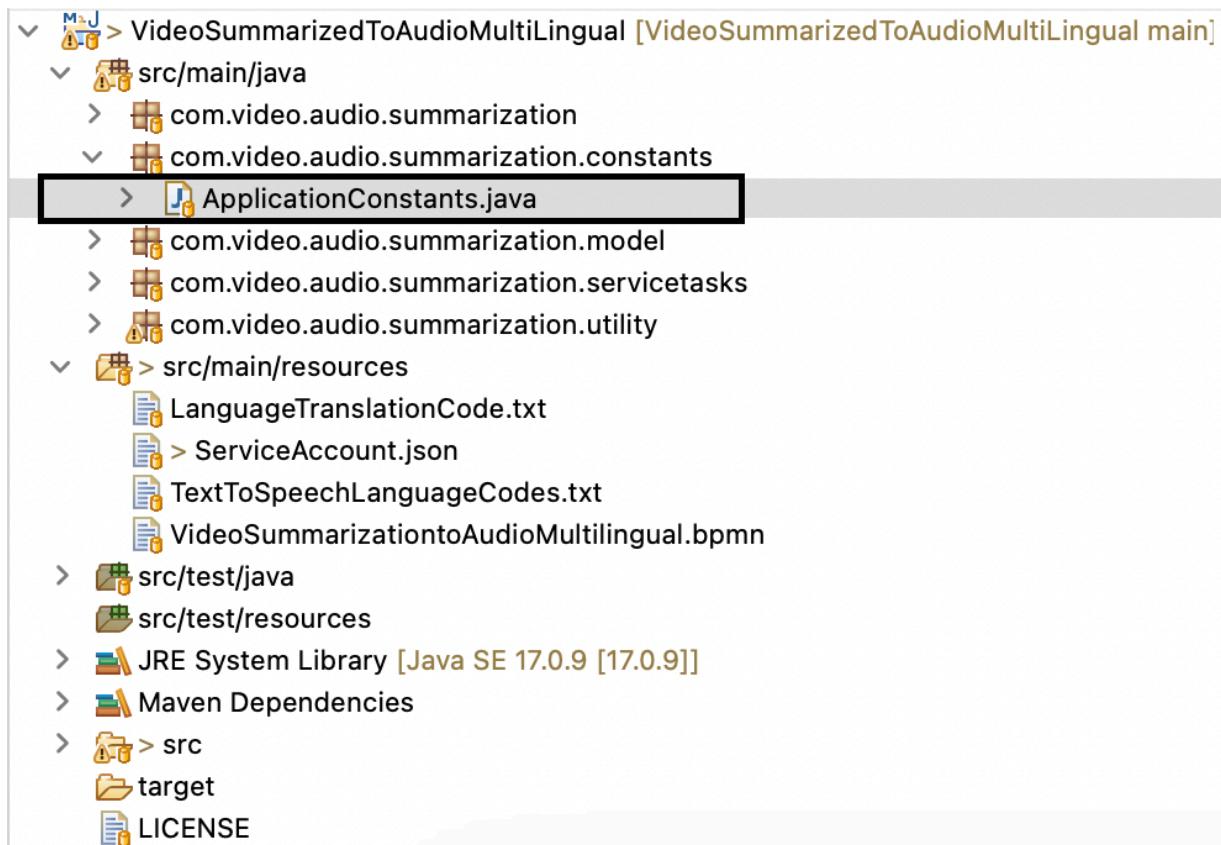
Role Cloud Translation API User	IAM condition (optional) ? + Add IAM condition	Delete
User of Cloud Translation and AutoML models		
Role Service Usage Viewer	IAM condition (optional) ? + Add IAM condition	Delete
Ability to inspect service states and operations for a consumer project.		
Role Storage Admin	IAM condition (optional) ? + Add IAM condition	Delete
Grants full control of buckets and objects.		
Role Vertex AI User	IAM condition (optional) ? + Add IAM condition	Delete
Grants access to use all resource in Vertex AI		
+ Add another role		

Place your Service account in sir/main/resources and Copy the service account file name and configure it in ApplicationConstants.java

Step1:



Step;2



```

public class ApplicationConstants {

    public static final String BUCKET_NAME = "BucketName";   → Update Bucket Name with Google Cloud Storage BucketName
    public static final String GCSBUCKETPATH = "gs://"+BUCKET_NAME+"/";
    //Specify access to individual objects by using object-level permissions (ACLs)
    //if this flag is set true. Please provide public access permission to bucket.
    public static final boolean BUCKET_ACCESS_CONTROL_FINE_GRAINED=false;

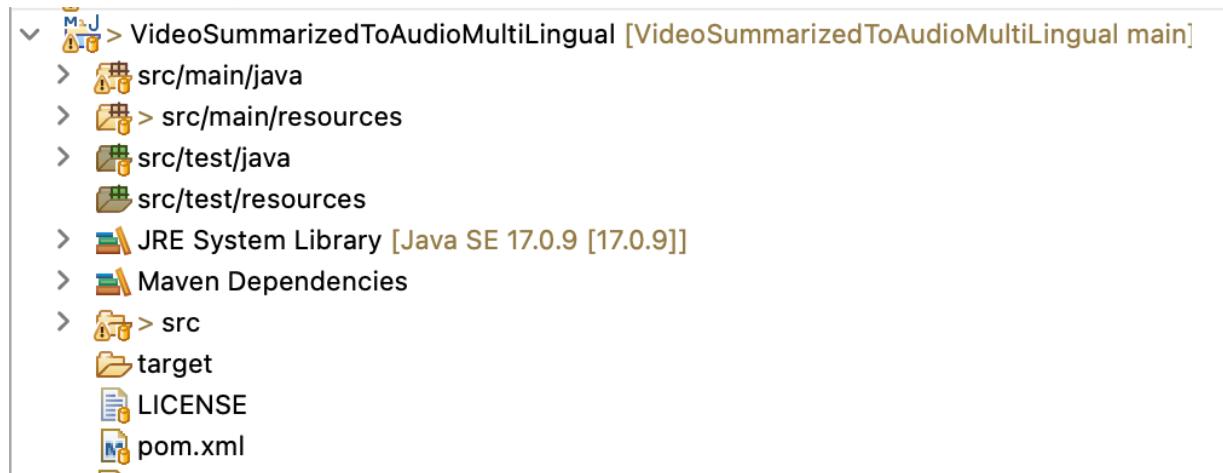
    public static final String projectId = "projectId";   → Update ProjectId with projectId in Service Account
    //For vertex AI API
    public static final String location = "us-central1";
    public static final String modelName = "gemini-2.5-pro";
    public static final String videoContentType = "video/mp4";
    public static final String audioContentType = "audio/mpeg";
    public static final String GCSAudioOutputFolder = "audio/";
    public static final String SummaryAudioOutputFolder = "/Users/lalamanil/voiceanalyzer/Summary";
    public static final List<String> APIs = Arrays.asList("storage.googleapis.com", "videointell:aiplatform.googleapis.com", "translate.googleapis.com", "speech.googleapis.com");
    public static final String RESET = "\u001B[0m";
    public static final String RED = "\u001B[31m";
    public static final String GREEN = "\u001B[32m";
    public static final String YELLOW = "\u001B[33m";
    public static final String BLUE = "\u001B[34m";
    public static final String PURPLE = "\u001B[35m";
    public static final String CYAN = "\u001B[37m";
    public static final String SERVICE_ACCOUNT_NAME = "Service_Account_FileName.json";  

}

```

How to Run APP:

Go to the root folder as shown below. This app is packaged as Fat jar



```

<build>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-shade-plugin</artifactId>
      <version>3.5.0</version>
      <executions>
        <execution>
          <phase>package</phase>
          <goals>
            <goal>shade</goal>
          </goals>
          <configuration>
            <transformers>
              <transformer
                implementation="org.apache.maven.plugins.shade.resource.ManifestResourceTransformer"
                mainClass="com.video.audio.summarization.App" />
            </transformer>
            <transformer
              implementation="org.apache.maven.plugins.shade.resource.ServicesResourceTransformer"/>
            </transformers>
            <filters>
              <filter>
                <artifact>*:*</artifact>
                <excludes>
                  <exclude>META-INF/*.SF</exclude>
                  <exclude>META-INF/*.DSA</exclude>
                  <exclude>META-INF/*.RSA</exclude>
                </excludes>
              </filter>
            </filters>
          </configuration>
        </execution>
      </executions>
    </plugin>
  </plugins>
</build>

```

Either Run App.java from eclipse IDE or go to command prompt fire mvn package which will generate the jar file under target folder. Then run java -jar <Jarfile>

Output Sample:

```

List of APIs should be Enabled for project: gmemoridev2016
✓ storage.googleapis.com enabled
✓ videointelligence.googleapis.com enabled
✓ aiplatform.googleapis.com enabled
✓ translate.googleapis.com enabled
✓ speech.googleapis.com enabled
Please provide the path of video
/Users/lalamanil/voiceanalyzer/Obama.mp4
/Users/lalamanil/voiceanalyzer/Obama.mp4. Exits
fileName:Obama.mp4
✓ Bucket exists: videosummarytranslation
fileuploaded to GCS bucket:videosummarytranslation with object name:Obama.mp4 selflink:https://www.googleapis.com/storage/v1/b/videosummarytranslation/o
upload status of Obama.mp4 in GCS is:true
closing br in getGoogleSupportedLanguageCodes

```

Afrikaans
Amharic
Arabic
Bengali
Bulgarian
Chinese(Simplified)
Chinese(Traditional)
Croatian
Czech
Danish
Dutch
English
Estonian
Finnish
French_Canadian
French_France
German
Greek
Gujarati
Hindi
Hungarian
Icelandic
Indonesian
Italian
Japanese
Kannada
Korean
Latvian

Lithuanian

Malay

Malayalam

Marathi

Polish

Portuguese

Punjabi

Romanian

Russian

Serbian

Slovak

Slovenian

Spanish

Swahili

Swedish

Tamil

Telugu

Thai

Turkish

Ukrainian

Urdu

Vietnamese

Please enter the language to which audio summary should translate from above list

Telugu

gcsvideopath is:gs://videosummarytranslation/Obama.mp4

Video Intelligence Service Client is created

⌚ Video processing... Please wait.

✓ Bucket exists: videosummarytranslation

fileuploaded to GCS bucket:videosummarytranslation with object name:audio/Obama.mp3 selflink:<https://www.googleapis.com/storage/v1/b/videosummarytransla>

Audio content written to file:/Users/lalamanil/voiceanalyzer/SummaryAudioOutput/Obama.mp3

summary--->This text is a reflection from former President Barack Obama on the 15th anniversary of the Affordable Care Act (ACA). He makes the following

Success and Impact: The ACA was created to establish healthcare as a right, not a privilege. It has successfully provided nearly 50 million Americans

A Collective Effort: Obama emphasizes that the law, often called "Obamacare," was not just his achievement but the result of ordinary Americans and a

Political Risk: He acknowledges being warned that pushing for healthcare reform could cost him re-election, but he prioritized making a difference ov

The Obama Center: The upcoming Obama Presidential Center will feature stories and artifacts from those who fought for and benefited from the ACA, aim

The Work Isn't Finished: He describes the ACA as a "starter house"—a significant first step that needs to be built upon and improved until everyone h

```
<terminated> App [8] [Java Application] [/Library/java/JavaVirtualMachines/jdk-17.jdk/Contents/Home/bin/java (Jul 6, 2025, 12:50:18 AM - 12:52:12 AM) [pid: 22765]

ttsLanguageCode--->te-IN
AudioGCSMediaLink--->https://storage.googleapis.com/download/storage/v1/b/videosummarytranslation/o/audio%2FObama.mp3?generation=1751777531779889&alt=media
scriptsExecuted--->[(script=Read video file and push to GCS bucket, status=success), (script=pull transcripts from video using video intellegence API, status=success)]
language--->Telugu
videotranscripts--->It can feel like a different era sometimes but 15 years ago I signed the Affordable Care Act into law, the gold back then was to establish together we've taken a big step in the right direction.
Today, Almost 50 million, people have gotten quality affordable health, care through the ACA that's one in seven Americans and the percentage of people that means more sick kids get medicine.
More cancer patients have life-saving surgery.
more people with pre-existing conditions, enjoy the peace of mind, they deserve
But here's the thing, even though people like to talk about Obamacare, it didn't just happen because of me, it happened because Americans of all ages, When the Obama Presidential Center opens on the south side of Chicago next year, visitors will have a chance to hear from some of the folks who made that happen. You'll learn about Jim Houser. Ran an auto repair shop with nine full-time employees. Thanks to the ACA, Jim got help covering those workers. And he probably also brought his daughter Helen law, a 22 year old freelancer who also got covered under the ACA.
Besides hearing their stories, visitors will also get to see how people's lives have been changed forever. Thanks to the work we did together, and you're Residential leadership elected representatives people all around the country.
A lot of folks told me, I pay a political price. If I made Health Care reform a priority, some of them predicted. It would cost me re-election. But I've done. And Healthcare reform is one of those things.
With everything going on right now. It's easy to feel like regular folks. Can't change this country for the better, but it could happen 15 years ago. I think the ACA taught us that some things are bigger than politics and working to make sure people don't lose their livelihoods. When a family member gets sick, That's why we did it and we're not finished yet. I've always said that the ACA is like a starter house. It was a big step forward, but still just a first We look forward to seeing you next year.
translationLanguageCode--->te
SourceVideoGCSMediaLink--->https://storage.googleapis.com/download/storage/v1/b/videosummarytranslation/o/Obama.mp4?generation=175177744338187&alt=media
status--->true
Process stated with ID:4
```

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