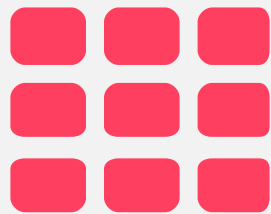


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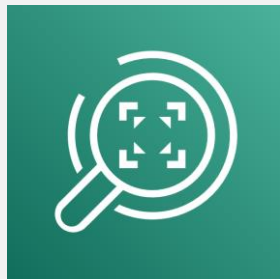






AMAZON MACHINE LEARNING





AMAZON REKOGNITION



Amazon Rekognition

- What is it?
- Common use cases
- Benefits
- Integration with other AWS Services

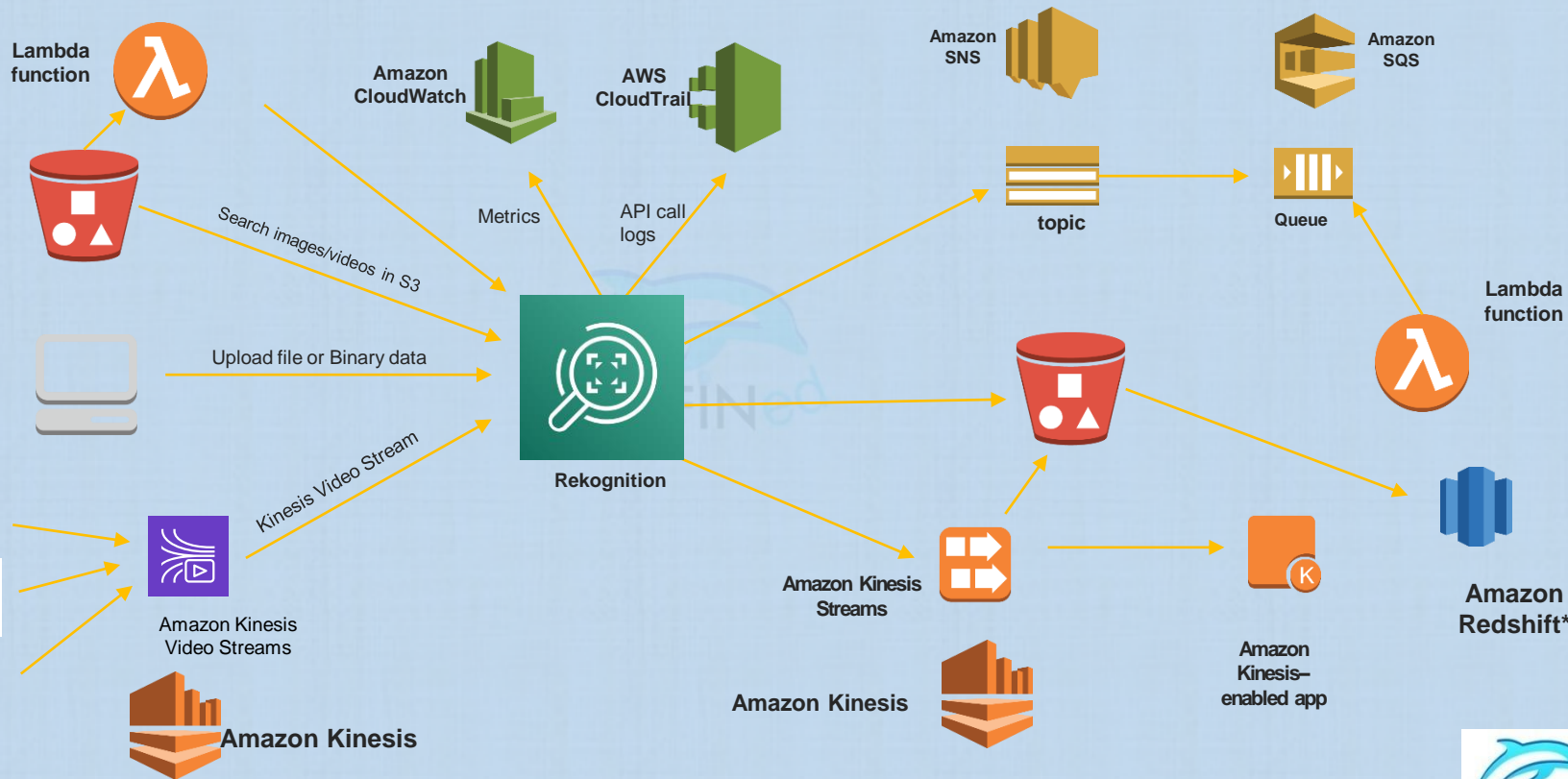


Amazon Rekognition – What is it

- Amazon Rekognition is a service that makes it easy to add powerful, image and video based, visual analysis to your applications.
 - Rekognition Image lets you easily build powerful applications to search, verify, and organize millions of images.
 - Rekognition Video lets you extract motion-based context from stored or live stream videos and helps you analyze them.
- You just provide an image or video to the Rekognition API, and the service can identify objects, people, text, scenes, and activities. It can detect any inappropriate content as well.
- Amazon Rekognition also provides highly accurate facial analysis and facial recognition. You can detect, analyze, and compare faces for a wide variety of use cases, including user verification, cataloging, people counting, and public safety.
- Amazon Rekognition is a HIPAA eligible service
- You need to ensure that the Amazon S3 bucket you want to use is in the same region as your Amazon Rekognition API endpoint.



Amazon Rekognition – What is it



Amazon Rekognition – How it works

- Amazon Rekognition provides two API sets, they are:
 - They are Amazon Rekognition Image, for analyzing images, and
 - Amazon Rekognition Video, for analyzing videos.
- Both API sets perform detection and recognition analysis of images and videos.
- Amazon Rekognition Video can be used to track the path of people in a stored video.
- Amazon Rekognition Video to search a streaming video for persons whose facial descriptions match facial descriptions already stored by Amazon Rekognition.
- RecognizeCelebrities API returns information for up to 100 celebrities detected in an image.
 - This includes information about where celebrity faces are detected on the image and where to get further information about the celebrity.



Amazon Rekognition – Common Use Cases

- **Searchable image and video libraries**
 - Amazon Rekognition makes images and stored videos searchable
- **Face-based user verification**
 - Can be used in building access or similar applications
 - Compares a live image to a reference image
- **Sentiment and demographic analysis**
 - Amazon Rekognition detects emotions such as happy, sad, or surprise, and demographic information such as gender from facial images.
 - Rekognition can analyze images, and send the emotion and demographic attributes to Amazon Redshift for periodic reporting on trends such as in store locations and similar scenarios.
- **Facial recognition**
 - Images, Stored Videos, and Streaming videos can be searched for faces that match those in a face collection.
 - A face collection is an index of faces that you own and manage.



Amazon Rekognition – Common Use Cases

- **Unsafe Content Detection**

- Amazon Rekognition can detect explicit and suggestive adult content in images and in videos.
- For example, social and dating sites, photo sharing platforms, blogs and forums, apps for children, e-commerce sites, entertainment and online advertising services.

- **Celebrity recognition**

- Amazon Rekognition can recognize thousands of celebrities (politicians, sports, business, entertainment and media) within supplied images and in videos.

- **Text detection**

- Detecting text in an Image allows for extracting textual content from images.



Amazon Rekognition - Benefits

- **Integrate powerful image and video recognition into your apps**
 - Amazon Rekognition removes the complexity of building image recognition capabilities into applications by making powerful and accurate analysis available with a simple API.
- **Deep learning-based image and video analysis**
 - Rekognition uses deep learning technology to accurately analyze images, find and compare faces in images, and detect objects and scenes within images and videos.
- **Scalable image analysis**
 - Amazon Rekognition enables for the analysis of millions of images
 - This allows for curating and organizing massive amounts of visual data.
- **Low cost**
 - Clients pay for the images and videos they analyze and the face metadata that stored.
 - There are no minimum fees or upfront commitments.



Amazon Rekognition – Integration with other AWS Services

- Rekognition's API can be called directly from Lambda in response to Amazon S3 events.
 - Since Amazon S3 and Lambda scale automatically in response to application's demand,
 - This allow for building scalable, affordable, and reliable image analysis applications.
 - You can run analysis directly on images stored in Amazon S3 without having to load or move the data.
- An example scenario:
 - Each time a person arrives at your residence, your door camera can upload a photo of the visitor to Amazon S3, triggering a Lambda function that uses Rekognition API operations to identify your guest.
- It integrates with AWS SNS to send notifications about results availability
- Rekognition also integrates with CloudWatch and CloudTrail for monitoring and API calls logging



Amazon Rekognition

- Detection and Recognition types
- Image and Video operations



Amazon Rekognition - Non-Storage and Storage Based Operations

- Amazon Rekognition operations are grouped into the following categories.
- Non-storage API operations –
 - In these operations, Amazon Rekognition does not persist any information.
 - You provide input images and videos, the operation performs the analysis, and returns results, but nothing is saved by Amazon Rekognition.
- Storage-based API operations –
 - Amazon Rekognition servers can store detected facial information in containers known as collections.
 - Amazon Rekognition provides additional API operations you can use to search the persisted face information for face matches.



Amazon Rekognition – Types of Detection and Recognition

- The types of detection and recognition that the **Amazon Rekognition Image API** and **Amazon Rekognition Video API** can perform are:
 - **Labels**
 - A label refers to any of the following: objects (flower, tree, or table), events (a wedding, graduation, or birthday party), concepts (a landscape, evening, and nature) or activities (getting out of a car).
 - Amazon Rekognition can detect labels in images and videos.
 - Activities are not detected in images.
 - To detect labels in images, use **DetectLabels**.
 - To detect labels in stored videos, use **StartLabelDetection**.
 - **Faces**
 - Amazon Rekognition can detect faces in images and stored videos.
 - Information can be obtained about where faces are detected in an image or video, facial landmarks such as the position of eyes, and detected emotions such as happy or sad.
 - It is possible to compare a face in an image with faces detected in another image.
 - Information about faces can also be stored for later retrieval.
 - To detect faces in images, use **DetectFaces**
 - To detect faces in stored videos, use **StartFaceDetection**.



Amazon Rekognition – Types of Detection and Recognition

- **Face Search**
 - Amazon Rekognition can search for faces.
 - Facial information is indexed into a container known as a collection.
 - Face information in the collection can then be matched with faces detected in images, stored videos, and streaming video.
 - To search for known faces in images, use **DetectFaces**.
 - To search for known faces in stored videos, use **StartFaceDetection**.
 - To search for known faces in streaming videos, use **CreateStreamProcessor**.
- **People Paths**
 - Amazon Rekognition can track the paths of people detected **in a stored video**.
 - Amazon Rekognition Video provides path tracking, face details, and in-frame location information for people detected in a video.
 - To detect people in stored videos, use **StartPersonTracking**.

Amazon Rekognition

○ Celebrities

- Amazon Rekognition can recognize thousands of celebrities **in images and stored videos**.
- Information can be obtained about where a celebrity's face is located on an image, facial landmarks and the pose of a celebrity's face.
- Tracking information can also be obtained for celebrities as they appear throughout a stored video.
- To recognize celebrities in images, **use RecognizeCelebrities**.
- To recognize celebrities in stored videos, **use StartCelebrityRecognition**

○ Text Detection

- Amazon Rekognition Text in Image can detect text in images and convert it into machine-readable text.
- To detect text in images, use **DetectText**

○ Unsafe Content

- Amazon Rekognition can analyze **images and stored videos** for explicit or suggestive adult content.
- To detect unsafe images, **use DetectModerationLabels**
- To detect unsafe stored videos, **use StartContentModeration**



Amazon Rekognition – Image Operations

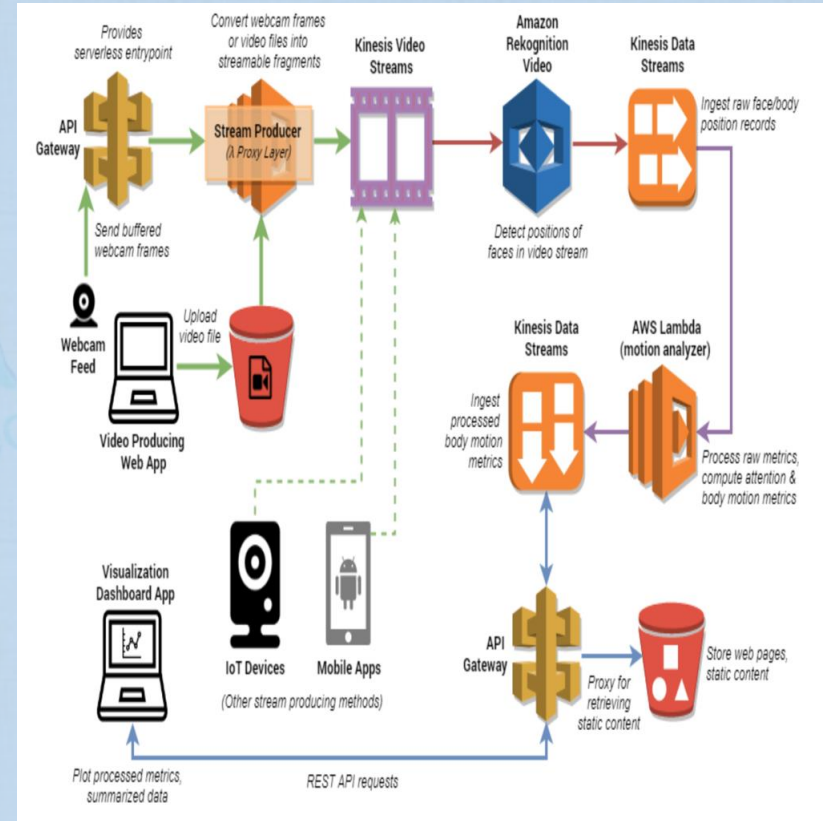
Amazon Rekognition Image Operations

- They are asynchronous.
- The input and response are in JSON format.
- Amazon Rekognition Image operations can analyze images that are supplied as image bytes or images stored in an Amazon S3 bucket.
 - Amazon Rekognition Image operations analyze an input image that is in **.jpg or .png** image format.
 - Byte64 encoded images bytes can be passed directly to an Amazon Rekognition API operation (uploaded from a local file system or through SDKs).



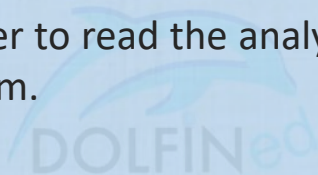
Amazon Rekognition – Video Operations

- Amazon Rekognition Video can analyze videos stored in an Amazon S3 bucket and videos streamed through Amazon **Kinesis Video Streams**.
- Amazon Rekognition Video video operations are asynchronous.
- With Amazon Rekognition Video storage video operations,
 - Analysis is started by calling the start operation for the type of the desired analysis.
 - For example, to detect faces in a stored video, call StartFaceDetection
 - Once completed, Amazon Rekognition publishes the completion status to an Amazon SNS topic.



Amazon Rekognition Video Operations and Video Streams

- To use Amazon Rekognition Video with streaming video, your application needs to implement the following:
 - A Kinesis video stream for sending streaming video to Amazon Rekognition Video.
 - An Amazon Rekognition Video stream processor to manage the analysis of the streaming video.
 - A Kinesis data stream consumer to read the analysis results that Amazon Rekognition Video sends to the Kinesis data stream.
- Recognizing Faces in a Streaming Video
 - Amazon Rekognition Video can search faces in a collection that match faces that are detected in a streaming video.



Amazon Rekognition

- Integration with Lambda, SQS, and Kinesis



Amazon Rekognition – AWS Lambda or SQS

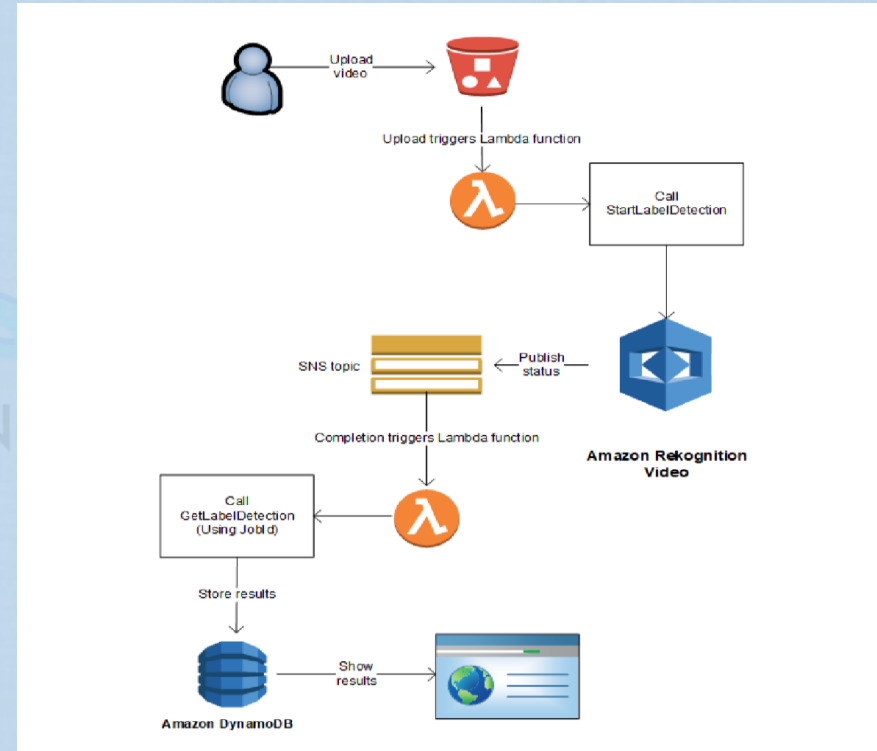
To get the status information that's published to the Amazon SNS topic by Amazon Rekognition Video, use one of the following options:

- **AWS Lambda –**

- You can subscribe an AWS Lambda function that you write to an Amazon SNS topic.
- The function is called when Amazon Rekognition notifies the Amazon SNS topic that the request has completed. Use a Lambda function if you want server-side code to process the results of a video analysis request.

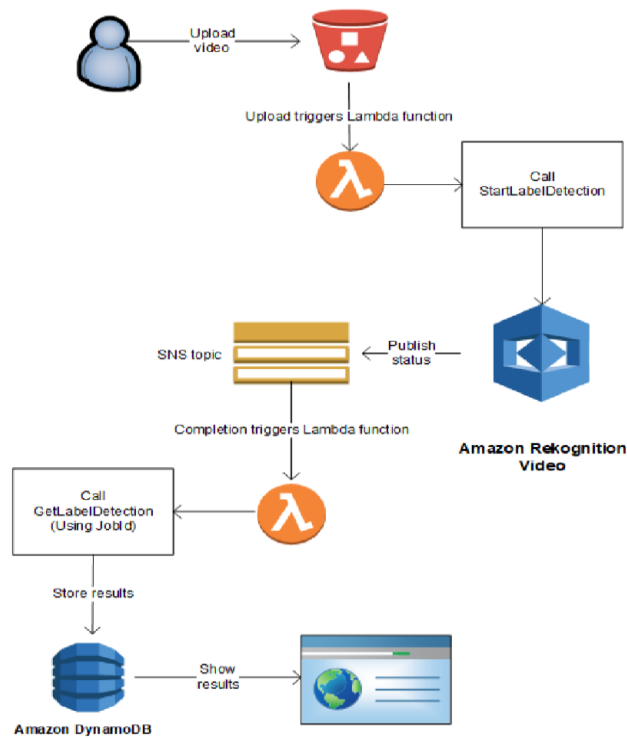
- **Amazon Simple Queue Service –**

- You can subscribe an Amazon SQS queue to an Amazon SNS topic.
- You then poll the Amazon SQS queue to retrieve the completion status that's published by Amazon Rekognition when a video analysis request completes.



Amazon Rekognition- Creating an Amazon Rekognition Lambda Function

- The following diagram shows a website that uses a Lambda function to automatically start analysis of a video when it's uploaded to an Amazon S3 bucket.
- When the Lambda function is triggered, it calls the section called "StartLabelDetection" to start detecting labels in the uploaded video.
- A second Lambda function is triggered when the analysis completion status is sent to the registered Amazon SNS topic.
- The second Lambda function calls the section called "GetLabelDetection" to get the analysis results.
- The results are then stored in a database in preparation for displaying on a webpage.



Amazon Rekognition – Detecting Text

- Amazon Rekognition Text in Image can detect text in images and convert it into machine-readable text. You can use the machine-readable text to implement solutions such as:
 - Visual search. An example is retrieving and displaying images that contain the same text.
 - Content insights. An example is providing insights into themes that occur in text recognized in extracted video frames. Your application can search recognized text for relevant content—such as news, sport scores, athlete numbers, and captions.
 - Navigation. An example is developing a speech-enabled mobile app for visually impaired people that recognizes the names of restaurants, shops, or street signs.
 - Public safety and transportation support. An example is detecting car license plate numbers from traffic camera images.
 - Filtering. An example is filtering out personally identifiable information from images.

