



## **Group 8**

Andrew Stefanich

Fenil Shah

Ravi Voleti

# Serverless Cloud Solution

# Problem Statement

Company X is a manufacturing company and produces widgets. Company X is in the process innovating their inspection process which has been completely manual to this point. Inspectors take pictures of widgets to ensure that the widgets are within compliance standards set by the Quality Assurance Group.

\*As a concrete implementation Company X is in the business of manufacturing Golden Retrievers on an assembly line.

# Objective

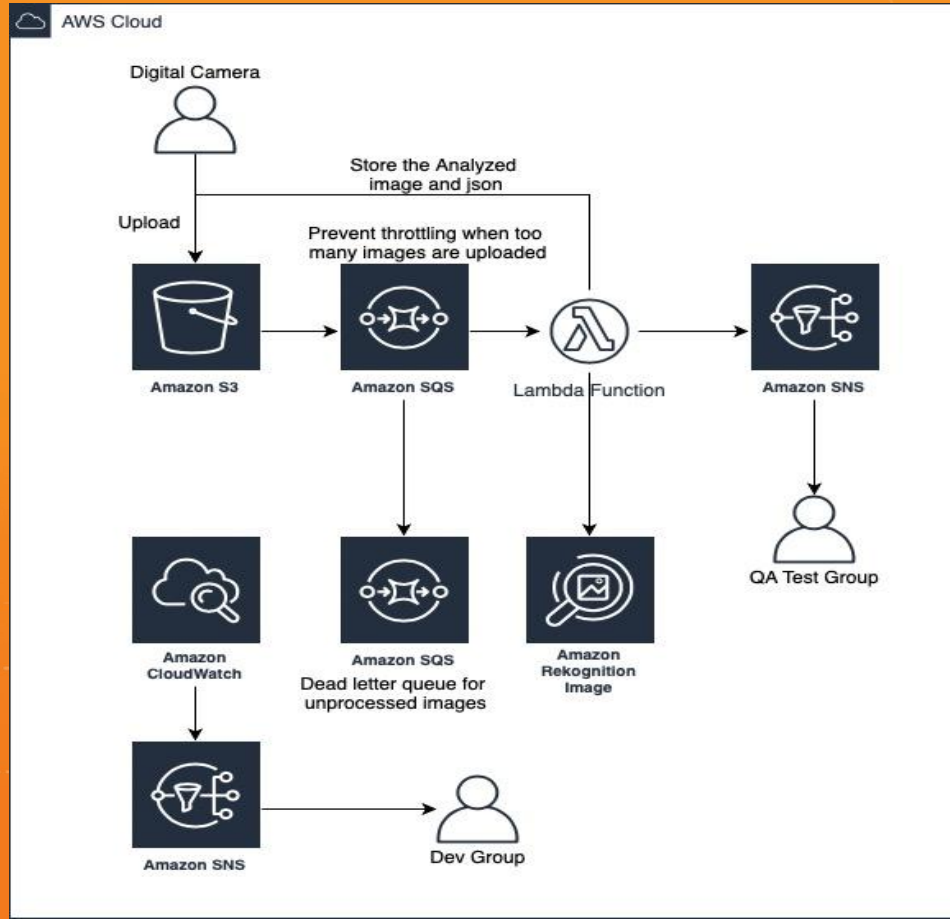
-The objective of this new project is to automate and innovate the existing process.

1. A digital picture of the widget is taken by a worker on the assembly line
2. The image is analyzed by the inspector to determine if each of the expected objects on the widget are present
3. Once the inspection is complete, a message is sent to the Quality Control group with the results of the inspector's analysis.
4. The original images as well as the analyzed images are stored for compliance purposes for 3 years

# Requirements

- 1) The current manual inspection process must be as automated as possible (fully automated)
- 2) The design and implementation must be serverless and leverage AWS best practices architecture
- 3) The inspection process will be automated using AWS image recognition services
- 4) The architecture/implementation will be completely event based starting with the presence of the digital image from the assembly line (assume that there is a camera on the assembly line that is able to take images and store them in the cloud).

# Architecture



# Components

- S3: Store the original and the analyzed images
- SQS
  - Queue: Prevent Throttling of lambda
  - Dead Letter Queue: Stores unprocessed messages
- Lambda: Serverless computation
- Rekognition: Inspect the image
- SNS:
  - notify-qa-group: Notify the Quality Control group
  - Notify-dev: Monitoring the cloudwatch alarms
- CloudWatch: Monitoring the application

Amazon S3 &gt; company-x-images


## company-x-images

## Bucket overview

Region

US East (N. Virginia) us-east-1

Amazon resource name (ARN)

 arn:aws:s3:::company-x-images

Creation date

December 12, 2020, 18:44  
(UTC-05:00)

Access

Bucket and objects not public

Objects

Properties

Permissions


Metrics

Management

Access points

Drag and drop files and folders you want to upload here, or choose **Upload**.

## Objects (4)

Objects are the fundamental entities stored in Amazon S3. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#) ☒ List versions

Delete

Actions ▼





Create folder

Upload

 Find objects by prefix

&lt; 1 &gt;



<input type="checkbox"/>	Name ▲	Type ▼	Last modified ▼	Size ▼	Storage class ▼
<input type="checkbox"/>	 image-processor.zip	zip	December 14, 2020, 21:33 (UTC-05:00)	9.5 MB	Standard
<input type="checkbox"/>	 processed-data/	Folder	-	-	-
<input type="checkbox"/>	 processed-images/	Folder	-	-	-
<input type="checkbox"/>	 raw-images/	Folder	-	-	-

# Raw image upload

## Objects (2)

Objects are the fundamental entities stored in Amazon S3. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

☐ List versions



Delete

Actions ▼



Create folder

Upload



1



<input type="checkbox"/>	Name ▲	Type ▼	Last modified ▼	Size ▼	Storage class ▼
<input type="checkbox"/>	 Collage_of_Nine_Dogs.jpg	jpg	December 14, 2020, 21:39 (UTC-05:00)	360.0 KB	Standard
<input type="checkbox"/>	 luna_1.jpg	jpg	December 14, 2020, 21:39 (UTC-05:00)	50.5 KB	Standard



# Processed Image



\*An image is deemed verified if it detects 1 and only 1 Golden Retriever

# Lifecycle policies

## Lifecycle rules (3)

Use lifecycle rules to define actions you want Amazon S3 to take during an object's lifetime such as transitioning objects to another storage class, archiving them, or deleting them after a specified period of time. [Learn more](#)



View details

Edit

Delete

Actions ▼

Create lifecycle rule

 Find lifecycle rules

	Lifecycle rule name ▼	Status ▼	Scope ▼	Current version actions ▼	Previous version actions ▼	Expired object delete markers ▼	Incomplete multipart uploads ▼
<input type="radio"/>	<a href="#">original-images-lifecycle-policy</a>	✔ Enabled	Prefix: raw-images/	Transition to Standard-IA, then Glacier, then expires	Permanently delete	-	-
<input type="radio"/>	<a href="#">processed-image-lifecycle-policy</a>	✔ Enabled	Prefix: processed-images/	Transition to Standard-IA, then Glacier, then expires	Permanently delete	-	-
<input type="radio"/>	<a href="#">remove-processed-data</a>	✔ Enabled	Prefix: processed-data/	Transition to Standard-IA, then Glacier, then expires	Permanently delete	-	-

Amazon SQS &gt; Queues

## Queues (2)



Edit

Delete

Send and receive messages

Actions ▼

Create queue

&lt; 1 &gt;

	Name ▲	Type ▼	Created ▼	Messages available ▼	Messages in flight ▼	Encryption ▼	Content-based deduplication ▼
<input type="radio"/>	<a href="#">DLQ-buffer-for-images</a>	Standard	12/12/2020, 18:59:39 EST	0	0	-	-
<input type="radio"/>	<a href="#">buffer-for-images</a>	Standard	12/12/2020, 18:50:06 EST	0	0	-	-

# Lambda

## ▼ Designer



image-processor



Layers

(0)



SQS



Amazon SNS

+ Add trigger

+ Add destination

# Permissions (for AWS Lambda)



Permissions

Trust relationships

Tags





Access Advisor

Revoke sessions

▼ Permissions policies (5 policies applied)

Attach policies

Add inline policy

Policy name ▼	Policy type ▼	
▶  AmazonS3FullAccess	AWS managed policy	✕
▶  AmazonRekognitionReadOnlyAccess	AWS managed policy	✕
▶  AWSLambdaSQSQueueExecutionRole	AWS managed policy	✕
▶  AWSLambdaBasicExecutionRole	AWS managed policy	✕
▶ AWSLambdaSNSTopicDestinationExecutionRole-60d7deda-e1d9-4c80-84bd-f7d348f13a7e	Managed policy	✕

▶ Permissions boundary (not set)

## notify-qa-group

Edit

Delete

Publish message

## Details

Name

notify-qa-group

Display name

notify-qa-group

ARN

arn:aws:sns:us-east-1:404670312311:notify-qa-group

Topic owner

404670312311

Type

Standard

Subscriptions

Access policy

Delivery retry policy (HTTP/S)

Delivery status logging

Encryption

Tags

## Subscriptions (3)

Edit

Delete

Request confirmation

Confirm subscription

Create subscription

Q Search

&lt;

1

&gt;



	ID ▾	Endpoint ▾	Status ▾	Protocol ▲
<input type="radio"/>	d6e84015-580e-408d-a37f-3f381de41792	andrewstefanich@gmail.com	✔ Confirmed	EMAIL
<input type="radio"/>	1f762e3a-7098-4336-aaa3-a75badc41880	stefanich.a@northeastern.edu	✔ Confirmed	EMAIL
<input type="radio"/>	8f8923c6-40c1-4e96-a088-874c3033c4bc	shah.fe@northeastern.edu	✔ Confirmed	EMAIL

# Demonstration



# Email (Verification Success)



## AWS Notification Message



**notify-qa-group** <no-reply@sns.amazonaws.com>



Wed 12/16/2020 9:28 PM

To: Andrew Stefanich

Verification Successful file: golden\_retriever\_1

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[Reply](#)

[Forward](#)



# Email (Verification Failure)



## AWS Notification Message



notify-qa-group <no-reply@sns.amazonaws.com>



Wed 12/16/2020 9:10 PM

To: Andrew Stefanich

Verification Failed file: bullmastiff

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Reply

Forward

# CloudWatch



## Log streams (13)



Dele

Filter log streams or try prefix search

<input type="checkbox"/>	Log stream ▾	Last event time
<input type="checkbox"/>	2020/12/17/[\$LATEST]23e95b0e471844aab692ae15880a27cf	2020-12-17 15:38:45 (UTC-05:00)
<input type="checkbox"/>	2020/12/17/[\$LATEST]8d54999c5c664721881c521222fcfd0	2020-12-16 21:54:16 (UTC-05:00)
<input type="checkbox"/>	2020/12/17/[\$LATEST]03e6b193b3874631a810e28c24cfa1c8	2020-12-16 21:28:01 (UTC-05:00)
<input type="checkbox"/>	2020/12/17/[\$LATEST]420917db446847d384334af3c1894396	2020-12-16 21:10:27 (UTC-05:00)
<input type="checkbox"/>	2020/12/17/[\$LATEST]2a481f49bf364929b2a690a6c91ae7c4	2020-12-16 21:08:12 (UTC-05:00)
<input type="checkbox"/>	2020/12/15/[\$LATEST]b1c9c2bc2343423aa0e27a0644eeb33d	2020-12-14 21:39:42 (UTC-05:00)
<input type="checkbox"/>	2020/12/15/[\$LATEST]122122c91c2847a2b71b2faa5a7d3c19	2020-12-14 21:32:29 (UTC-05:00)
<input type="checkbox"/>	2020/12/15/[\$LATEST]a2d3debe60734bac84bd7960941cb4c4	2020-12-14 20:06:32 (UTC-05:00)
<input type="checkbox"/>	2020/12/15/[\$LATEST]a0ee9230092b44839181477b5417c7f1	2020-12-14 19:16:51 (UTC-05:00)
<input type="checkbox"/>	2020/12/14/[\$LATEST]7f94a90d732f48679cf0b8949441338c	2020-12-14 18:56:15 (UTC-05:00)
<input type="checkbox"/>	2020/12/14/[\$LATEST]0ed6fc5f49ae4aa19d0907e7df1de4c7	2020-12-14 18:47:29 (UTC-05:00)
<input type="checkbox"/>	2020/12/14/[\$LATEST]4baca405e1614a828995f415cdaaa2d0	2020-12-14 18:19:53 (UTC-05:00)
<input type="checkbox"/>	2020/12/14/[\$LATEST]550003cb680b495d88b6ca63f23b7238	2020-12-14 17:53:07 (UTC-05:00)

## Alarms (2)

☐ Hide Auto Scaling alarms

Search

<input type="checkbox"/>	Name ▾	State ▾
<input type="checkbox"/>	Lambda Throttled	✓ OK
<input type="checkbox"/>	Lambda failed	✓ OK

CloudWatch Logs

CloudWatch Alarms

# Thank you!