aws INNOVATE

AI/ML EDITION

24 February 2022

Build an intelligent marketing kiosk
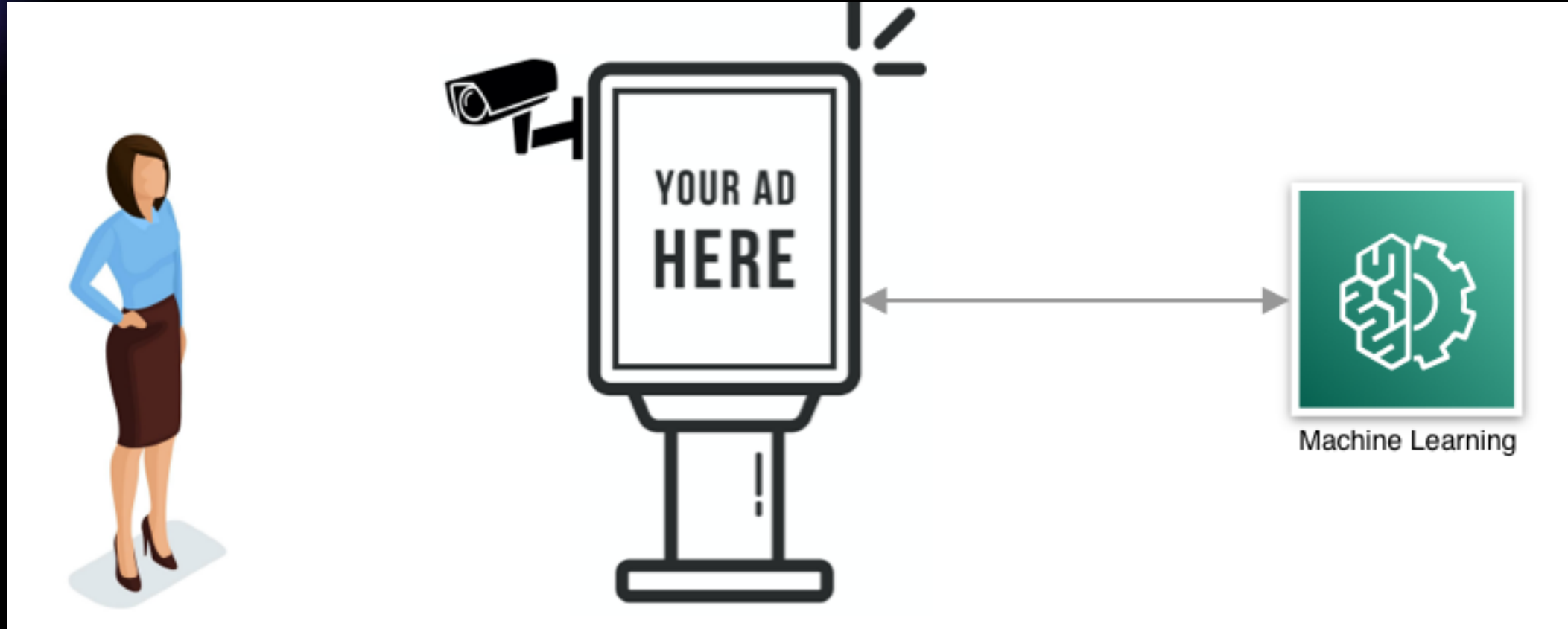
Vatsal Shah

Senior Solutions Architect
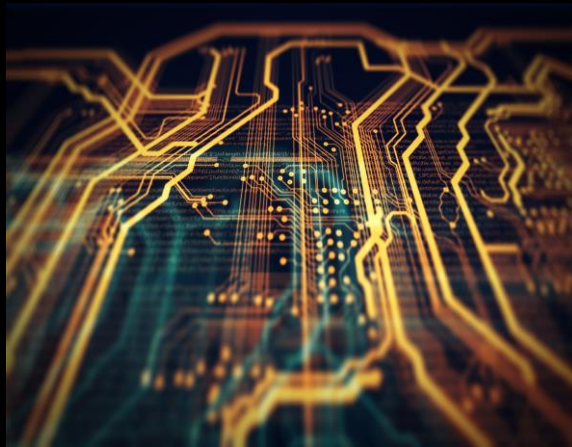AISPL

aws

Intelligent marketing kiosk/display

Requirements

Internet connectivity

Compute

Camera

Source: Amazon Freeway

Demo

localhost:8080

Internal Search | Inside | Utilities | HR | Git | Training & Certific... | IT | Follow | Travel | Personal | Productivity | Perks | Tutorials | Code Samples | Cost Explorer

Intelligent Marketing Kiosk

Home

Audience

shahvats@38f9d36c19dd:~/Developer/amazon-kinesis-video-streams-producer-sdk-cpp/build

21%   12 GB

```
[DEBUG] [27-01-2021 10:29:02:714.227 UTC] postReadCallback(): Wrote 65524 bytes to Kinesis Video. Upload st
ream handle: 0
[DEBUG] [27-01-2021 10:29:02:714.761 UTC] postReadCallback(): Wrote 16613 bytes to Kinesis Video. Upload st
ream handle: 0
[DEBUG] [27-01-2021 10:29:02:715.507 UTC] postReadCallback(): Wrote 3834 bytes to Kinesis Video. Upload str
eam handle: 0
[DEBUG] [27-01-2021 10:29:02:716.039 UTC] postReadCallback(): Pausing CURL read for upload handle: 0
[DEBUG] [27-01-2021 10:29:02:996.551 UTC] postWriteCallback(): Curl post body write function for stream wit
h handle: SmartAdEngine and upload handle: 0 returned: {"EventType":"RECEIVED","FragmentTimecode":161174333
6806,"FragmentNumber":"91343852333181957313921040735785473570831298733"}

[DEBUG] [27-01-2021 10:29:02:996.811 UTC] fragmentAckReceivedHandler invoked
[DEBUG] [27-01-2021 10:29:02:996.991 UTC] Reporting fragment ack received. Ack timecode 1611743336806
[DEBUG] [27-01-2021 10:29:02:998.500 UTC] postReadCallback(): Wrote 30396 bytes to Kinesis Video. Upload st
ream handle: 0
[DEBUG] [27-01-2021 10:29:03:000.086 UTC] postReadCallback(): Pausing CURL read for upload handle: 0
[DEBUG] [27-01-2021 10:29:03:000.746 UTC] postWriteCallback(): Curl post body write function for stream wit
h handle: SmartAdEngine and upload handle: 0 returned: {"EventType":"BUFFERING","FragmentTimecode":16117433
38303,"FragmentNumber":"91343852333181957318872800892926995050254268921"}

[DEBUG] [27-01-2021 10:29:03:000.936 UTC] fragmentAckReceivedHandler invoked
[DEBUG] [27-01-2021 10:29:03:001.134 UTC] Reporting fragment ack received. Ack timecode 1611743338303
[DEBUG] [27-01-2021 10:29:03:130.341 UTC] postWriteCallback(): Curl post body write function for stream wit
h handle: SmartAdEngine and upload handle: 0 returned: {"EventType":"PERSISTED","FragmentTimecode":16117433
36806,"FragmentNumber":"91343852333181957313921040735785473570831298733"}

[DEBUG] [27-01-2021 10:29:03:130.572 UTC] fragmentAckReceivedHandler invoked
[DEBUG] [27-01-2021 10:29:03:130.717 UTC] Reporting fragment ack received. Ack timecode 1611743336806
[DEBUG] [27-01-2021 10:29:03:130.865 UTC] postReadCallback(): Wrote 16068 bytes to Kinesis Video. Upload st
ream handle: 0
[DEBUG] [27-01-2021 10:29:03:131.092 UTC] postReadCallback(): Pausing CURL read for upload handle: 0
^C
 ~/Dev/amazon-kinesis-video-streams-producer-sdk-cpp/build | master ?2
```

Uploader

Advertisement Display
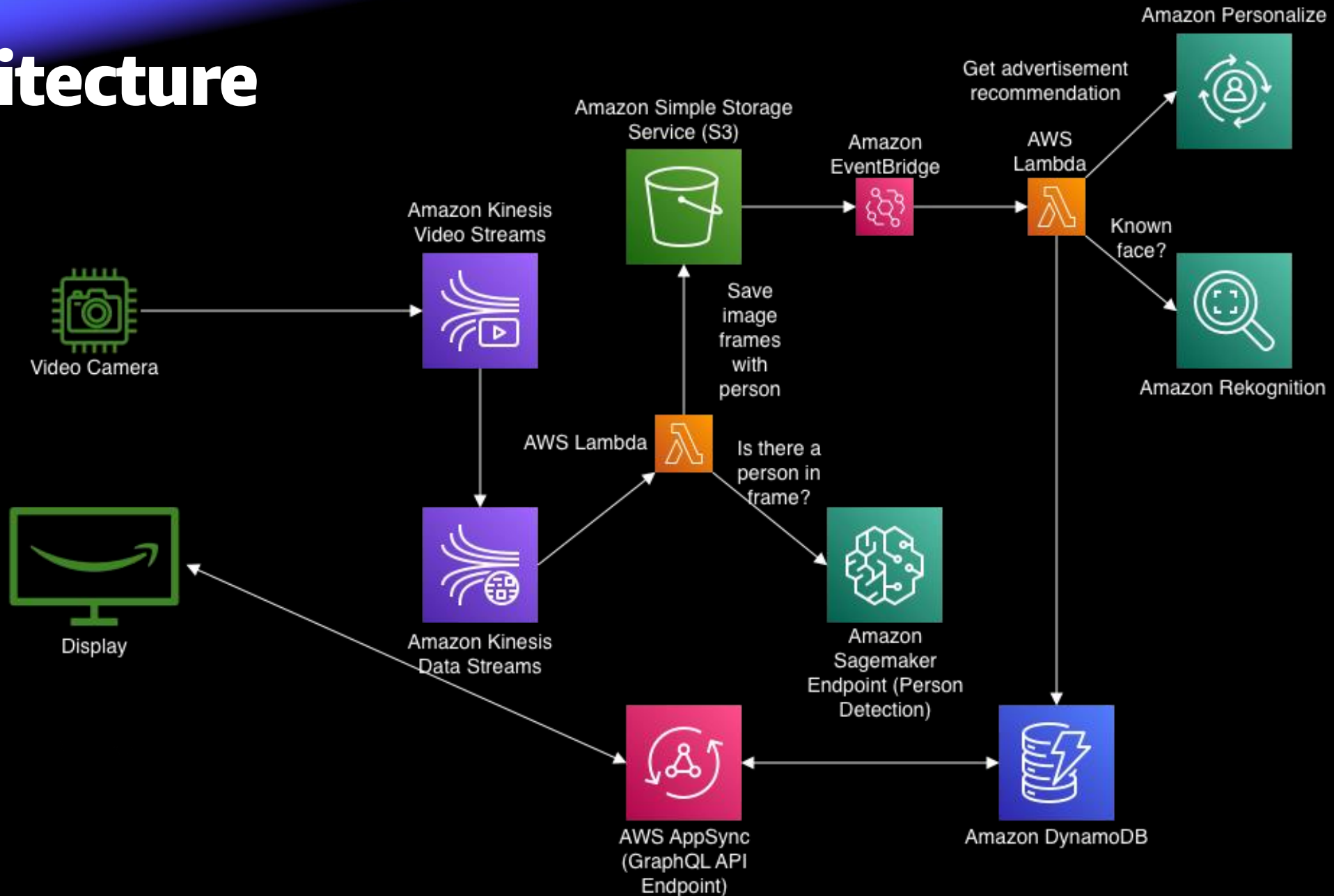
Fossil Women Pink Wallet
Rs. 2395

Adults-Women | Women

Architecture

Architecture

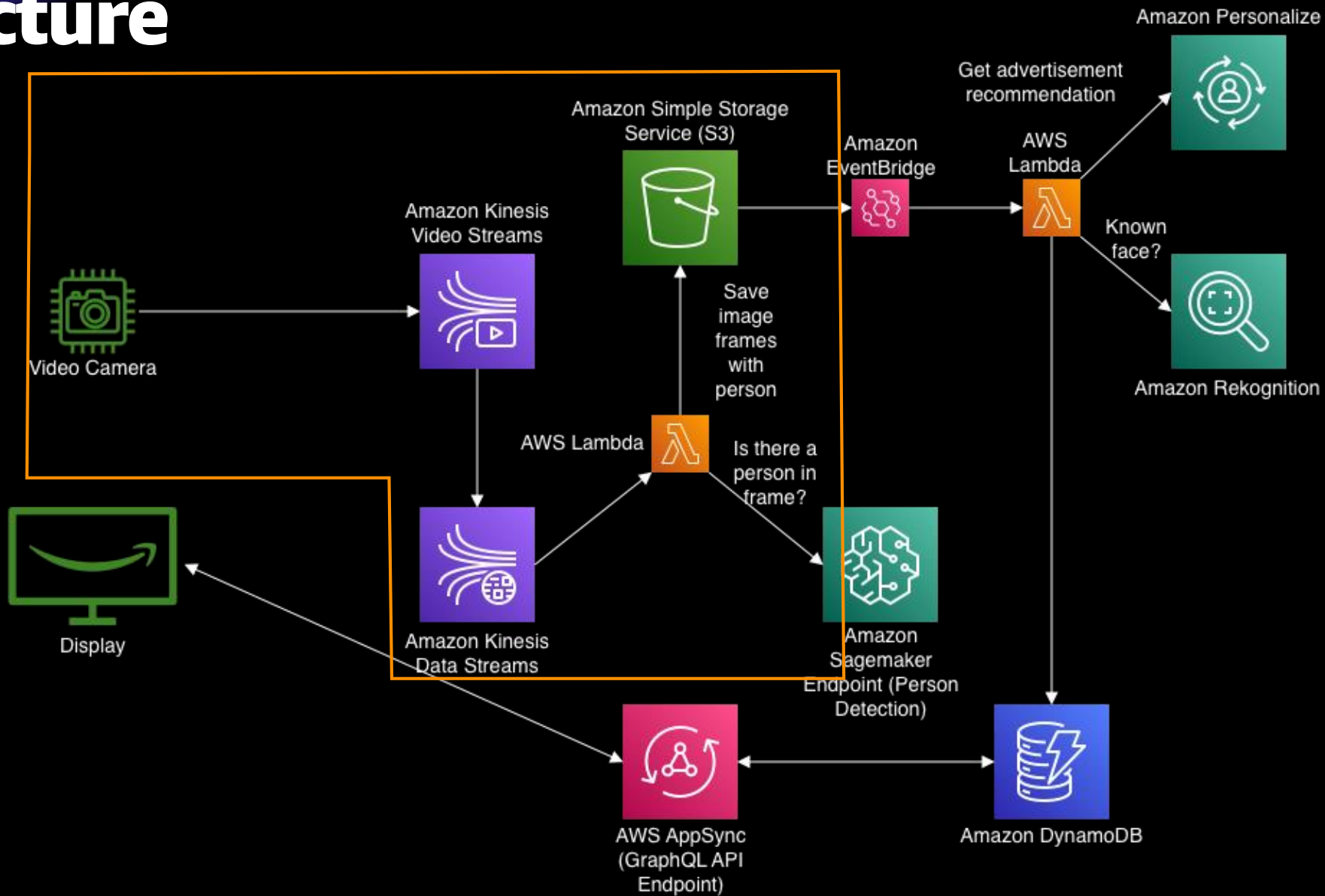# Part 1: Ingest video streams into Amazon S3

Amazon Kinesis Video Streams inference template for Amazon SageMaker (KIT)
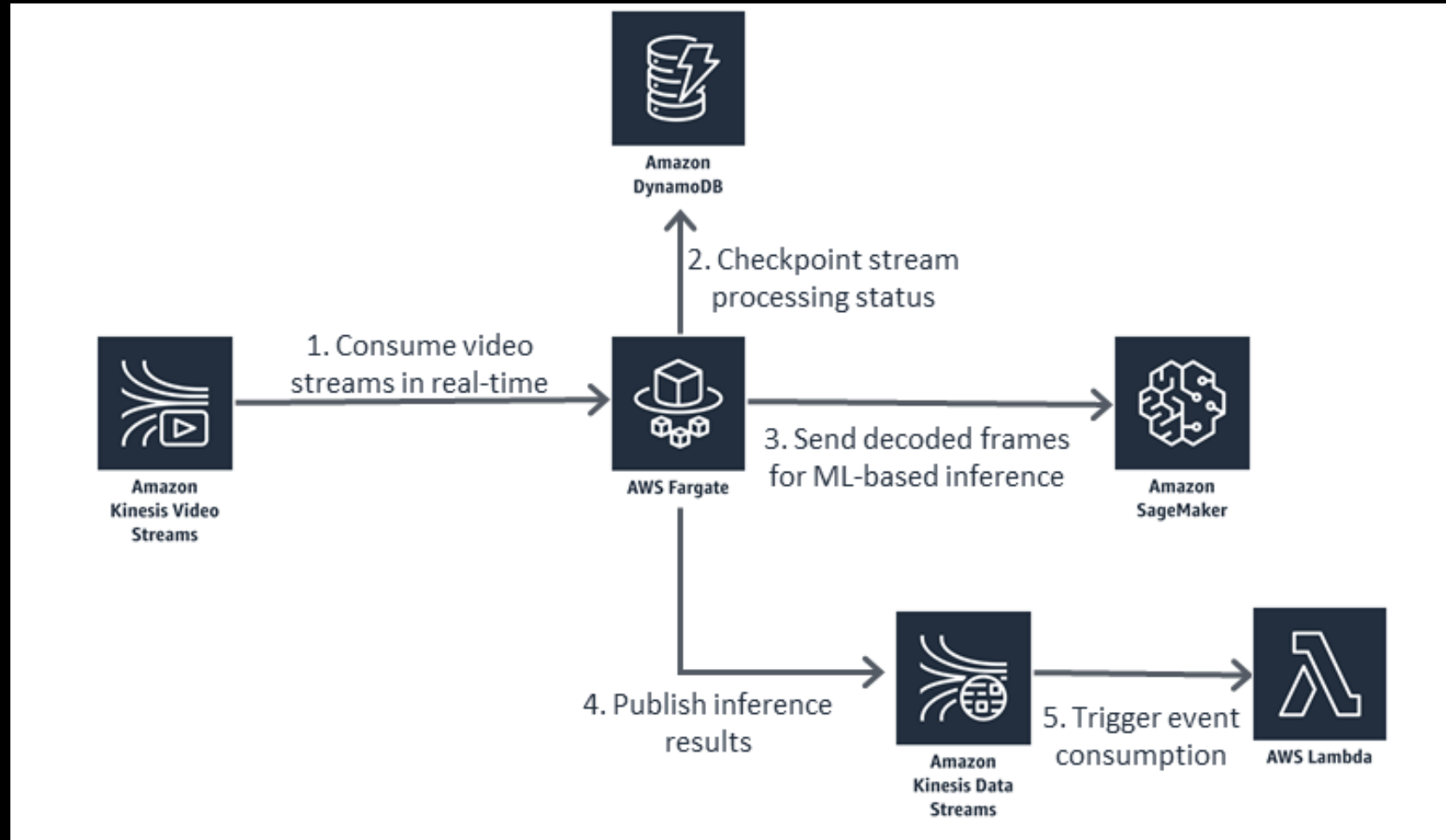
Architecture

Part 1

Part 2: Machine Learning APIs

We will use two kinds of Machine Learning APIs

- Use 'ready-made' AI Services called Amazon Rekognition and Amazon Personalize

- Build your own custom Machine Learning API using Amazon SageMaker for 'Person' Detection in an image

Filter frames with humans using Amazon SageMaker Object Detection SSD Custom Model

- Lists all labels detected their associated confidence scores and bounding box information

- Prediction

- Car 65.85% 0 284 183 480
- Car 64.72% 870 260 1014 394
- Car 60.79% 1048 283 1223 444
- Bicycle 42.53% 412 309 810 661
- Person 35.47% 517 183 688 614

Amazon Rekognition image

- Extract rich metadata from visual content

Object and scene detection

Facial analysis

Face comparison

Facial recognition

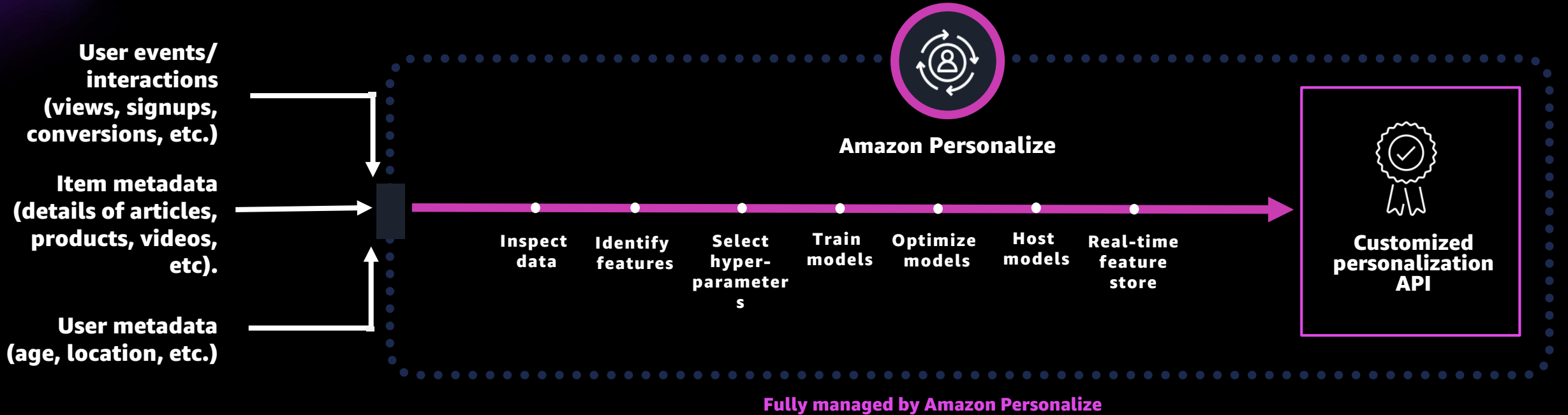Celebrity recognition

Image moderation

API used...

```
response = rekognition.detect_faces(Image={'S3Object': {
                                         'Bucket': bucket, 'Name': fileName},
                                 FaceMatchThreshold=threshold,
                                 MaxFaces=maxFaces)


faceMatches = response['FaceMatches']
```

```json
{
    "Face": {
        "FaceId": "ef293db6-2e6a-477d-809d-f32ca343a9a9",
        "BoundingBox": {
            "Width": 0.6185897588729858,
            "Height": 0.4639423191547394,
            "Left": 0.1955128163099289,
            "Top": 0.23557692766189575
        },
        "ImageId": "eeb0bced-71d6-583d-b51f-efd8fc7148ac",
        "ExternalImageId": "saraselfie.jpg",
        "Confidence": 99.99900817871094
    },
    "FaceDetail": {
        "BoundingBox": {
            "Width": 0.6185897588729858,
            "Height": 0.4639423191547394,
            "Left": 0.1955128163099289,
            "Top": 0.23557692766189575
        },
        "AgeRange": {
            "Low": 16,
            "High": 27
        },
        "Smile": {
            "Value": false,
            "Confidence": 86.85984802246094
        },
        "Eyeglasses": {
            "Value": true,
            "Confidence": 99.04279327392578
        },
        "Sunglasses": {
            "Value": false,
            "Confidence": 83.88410186767578
        },
        "Gender": {
            "Value": "Female",
            "Confidence": 100.0
        },
        "Beard": {
            "Value": false,
            "Confidence": 99.99989318847656
        },
        "Mustache": {
            "Value": false,
            "Confidence": 99.99994659423828
        },
```

Amazon Personalize

Behind the scenes

User events/
interactions
(views, signups,
conversions, etc.)

Item metadata
(details of articles,
products, videos,
etc).

User metadata
(age, location, etc.)

Amazon Personalize

Inspect
data

Identify
features

Select
hyper-
parameter
s

Train
models

Optimize
models

Host
models

Real-time
feature
store

Customized
personalization
API

Fully managed by Amazon Personalize

aws

Items dataset

```python
items_df = pd.read_csv("./data/fashion-dataset/items.csv")
```

```python
items_df.head()
```

	id	price	name	brand	age_group	gender	landing_page_url
0	29262	4599.0	ADIDAS Men Ambition VII Logo White Sports Shoes	ADIDAS	Adults-Men	Men	Sports-Shoes/ADIDAS/ADIDAS-Men-Ambition-VII-Lo...
1	20849	845.0	Spice Art Women Glass Silver Evening Clutch	Spice Art	Adults-Women	Women	Clutches/Spice-Art/Spice-Art-Women-Glass-Silve...
2	44106	3650.0	HUGO Men Fragrance Gift Set	HUGO	Adults-Men	Men	Fragrance-Gift-Set/HUGO/HUGO-Men-Fragrance-Gif...
3	25831	699.0	Diva Women Printed White Kurta	DIVA	Adults-Women	Women	Kurtas/DIVA/Diva-Women-Printed-White-Kurta/258...
4	43512	3999.0	French Connection Women Blue Dress	French Connection	Adults-Women	Women	Dresses/French-Connection/French-Connection-Wo...

```python
items_df.groupby('age_group')['id'].nunique()
```

```
age_group
Adults-Men      21887
Adults-Unisex    1942
Adults-Women    18426
Kids-Boys        1071
Kids-Girls        849
Kids-Unisex       270
Name: id, dtype: int64
```

Users dataset

```python
users_df = pd.read_csv("./data/imdb-wiki-face-dataset/users.csv")
```

```python
users_df.head()
```

	user_id	image_url	gender	face_id	age_group
0	98eeb7ab-dfa2-4372-b843-c695b0a38fea	s3://smart-ad-platform/training-data/wiki_crop...	female	bc69fcd4-2f3b-4db3-b582-7e2dea8b972a	Young Adult
1	5c907719-7822-426a-8d57-85635e595192	s3://smart-ad-platform/training-data/imdb_crop...	male	b9faa14a-4789-4326-ad0a-8fd8e853aac2	Old
2	6aee19da-3f80-4b04-8905-057709cf6b10	s3://smart-ad-platform/training-data/imdb_crop...	female	f54f8728-13c5-457f-8090-d5607abb5b91	Young Adult
3	8a118a85-fe7f-4394-b53c-f1df4da35950	s3://smart-ad-platform/training-data/imdb_crop...	male	7e985906-077c-45cc-9af8-6c1a5878fef3	Adult
4	56437b06-da2e-4f0d-aaa4-fc83867d5358	s3://smart-ad-platform/training-data/imdb_crop...	male	719d7f82-bfbe-4a99-9fc3-b2383a2f8547	Young Adult

```python
users_df.groupby('age_group')['user_id'].nunique()
```

```
age_group
Adult          88556
Kid             1892
Old            14025
Young          10669
Young Adult   109240
Name: user_id, dtype: int64
```

Interactions dataset

```
interactions_df.head()
```

	EVENT_TYPE	EVENT_VALUE	ITEM_ID	TIMESTAMP	USER_ID
0	CLICK	1	50995	07-03-2019 20:28:50	98eeb7ab-dfa2-4372-b843-c695b0a38fea
1	CLICK	1	20758	23-06-2018 04:12:07	98eeb7ab-dfa2-4372-b843-c695b0a38fea
2	CLICK	1	14103	21-11-2019 16:59:15	98eeb7ab-dfa2-4372-b843-c695b0a38fea
3	CLICK	1	59228	26-11-2018 04:14:40	98eeb7ab-dfa2-4372-b843-c695b0a38fea
4	CLICK	1	40533	02-06-2018 06:56:24	98eeb7ab-dfa2-4372-b843-c695b0a38fea

MovieLens - An educational walkthrough

MovieLens can be found here:
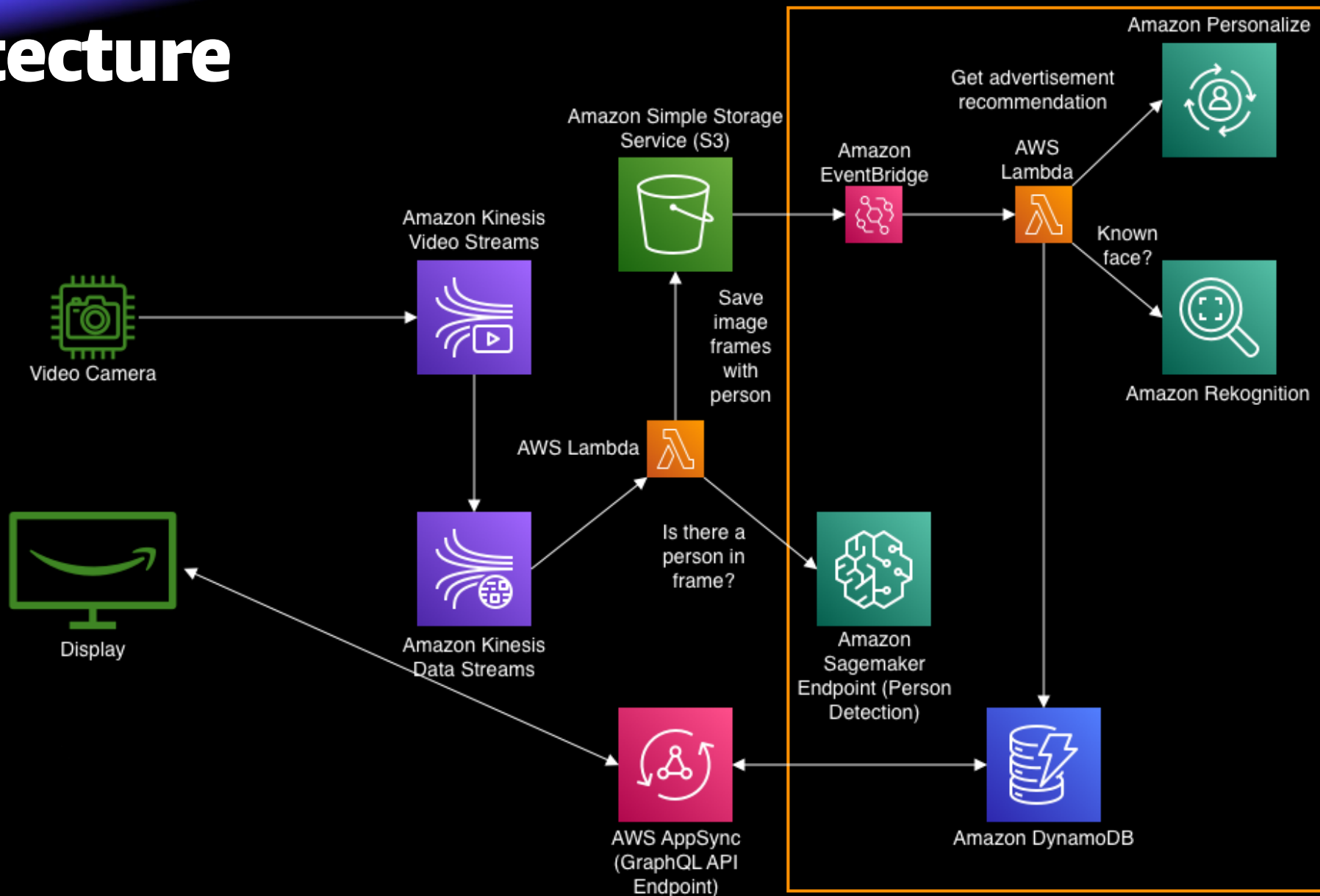https://github.com/aws-samples/amazon-personalize-samples/tree/master/getting_started

Features:
- Defining your data
- Creating a solution based on the data
- Integrating it with your application
- Embedding clickstream data
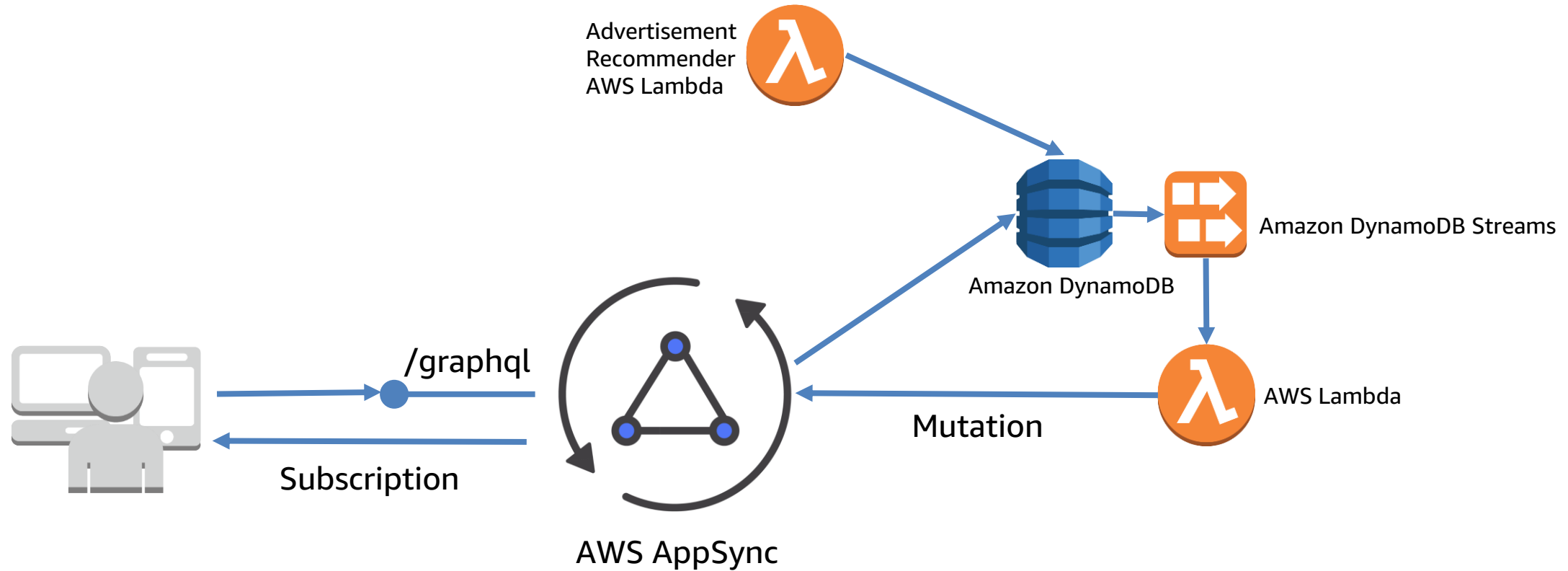
Total time: 2 hours start to finish

Architecture

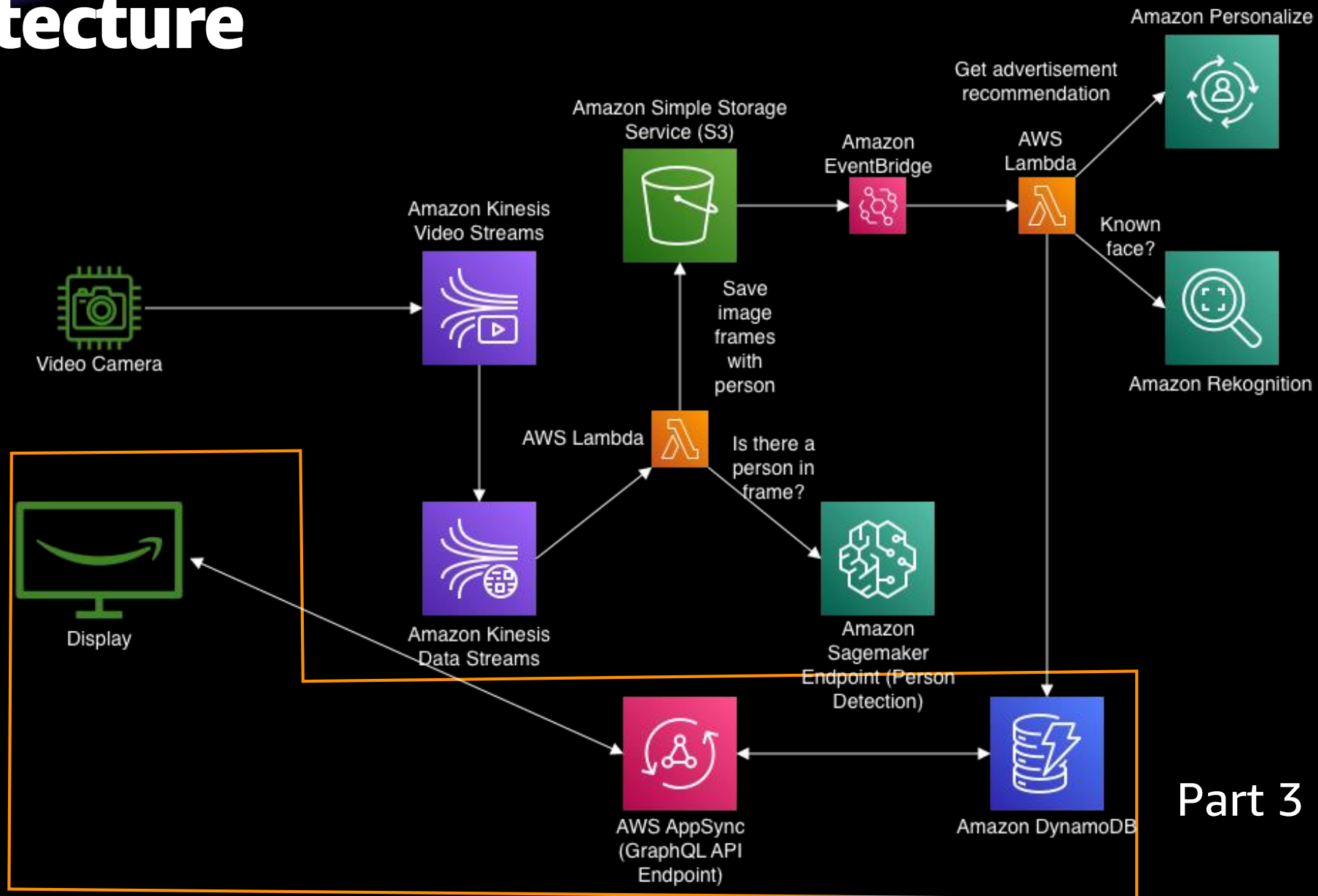Video Camera → Amazon Kinesis Video Streams

Amazon Kinesis Video Streams → Amazon Kinesis Data Streams

Amazon Simple Storage Service (S3)

Save image frames with person

AWS Lambda

Is there a person in frame?

Amazon Sagemaker Endpoint (Person Detection)

Amazon EventBridge

Get advertisement recommendation

AWS Lambda

Amazon Personalize

Known face?

Amazon Rekognition

Display

AWS AppSync (GraphQL API Endpoint)

Amazon DynamoDB

Part 3: Serving personalized advertisements

Real-time app – AWS AppSync

Advertisement Recommender AWS Lambda

Amazon DynamoDB

Amazon DynamoDB Streams

AWS Lambda

/graphql

Subscription

Mutation

AWS AppSync

Architecture

Part 3

Resources

- Amazon Kinesis Inference Template (KIT) - https://aws.amazon.com/blogs/machine-learning/analyze-live-video-at-scale-in-real-time-using-amazon-kinesis-video-streams-and-amazon-sagemaker/

- Amazon Kinesis Video Streams Producer Library - https://github.com/awslabs/amazon-kinesis-video-streams-producer-sdk-cpp

- AWS AppSync and GraphQL - https://docs.aws.amazon.com/appsync/latest/devguide/graphql-overview.html

- Code samples for Amazon Rekognition and Amazon DynamoDB - https://docs.aws.amazon.com/code-samples/latest/catalog/welcome.html

- Amazon Personalize walkthrough - https://github.com/aws-samples/amazon-personalize-samples/tree/master/getting_started

- AWS NorthStar - Create a front end prototype based on ReactJS, AWS Amplify and AWS AppSync in minutes - https://github.com/aws/aws-northstar

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Dive deeper into these resources, get inspired and learn how you can use AI and machine learning to accelerate your business outcomes.

- The machine learning journey e-book
- 7 leading machine learning use cases e-book
- A strategic playbook for data, analytics, and machine learning e-book
  Accelerate machine learning innovation with the right cloud services & infrastructure e-book
- Choosing the right compute infrastructure for machine learning e-book
- Improving service and reducing costs in contact centers e-book
- Why ML is essential in your fight against online fraud e-book
- … and more!

https://bit.ly/3mwi59V

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Thank you!

Vatsal Shah

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