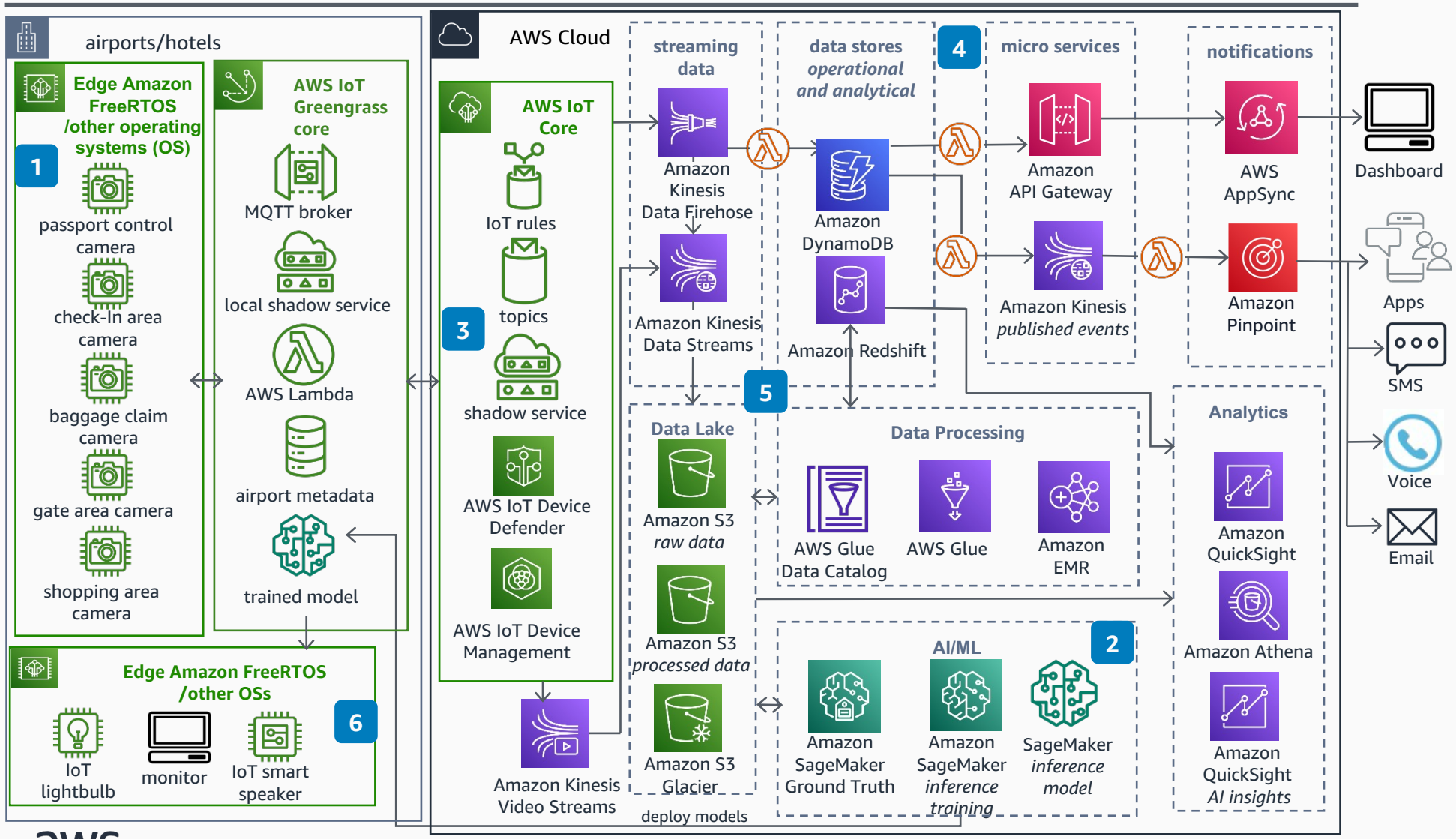
Queue Depth Management Using IoT and AI/ML

This architecture shows how you can improve customer experience using the Internet of Things (IoT) and artificial intelligence/machine learning (AI/ML) by monitoring queues using cameras, using computer vision to measure queue depth, and providing visual and audible alerts about bottlenecks and unreasonable queue depths to customer service managers.



1 Place cameras in important areas to improve customer wait times.

2 **AWS IoT Greengrass**, **AWS IoT Core**, and **AWS IoT Device Management** manage the cameras and run inference on the edge with **AWS Lambda** and **Amazon SageMaker**.

3 To perform inference training, the cameras collect video streams for four days or more. This recording is used to tune and train **Amazon SageMaker** to generate a head detection model. **Amazon SageMaker Ground Truth** labels the heads in the training video feeds.

4 Use purpose built databases and serverless architecture to deliver microservices and alerts. **Amazon DynamoDB**, **Amazon Kinesis**, **AWS Lambda**, **Amazon API Gateway**, and **AWS AppSync** provide the capabilities required for the near real-time microservices, notifications, and events to build mobile apps and dashboards. The dashboard can also be used to configure queue depth, threshold alerts, and area of interest for each camera.

5 **Amazon Simple Storage Service** (Amazon S3), **Amazon Redshift**, and **Amazon QuickSight** provide the data lake and analytics platform for the solution. With **Amazon SageMaker**, you can build, deploy, train, and tune AI/ML models. **Amazon Athena** can be used for as-needed data analysis on the data lake.

6 Show queue depth on a monitor, notifications to a smart speaker, or update the state of an IoT lightbulb in case of a busy period such as an unexpected weather event causing flight cancellations increasing queues at check-in.

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AWS Reference Architecture