



aws INNOVATE

AI/ML EDITION

24 February 2022

Running intelligent applications at edge using AWS AI/ML

Arun Balaji

Prototyping Engineer, AISPL

Jeeri Deka

Solutions Architect, AISPL

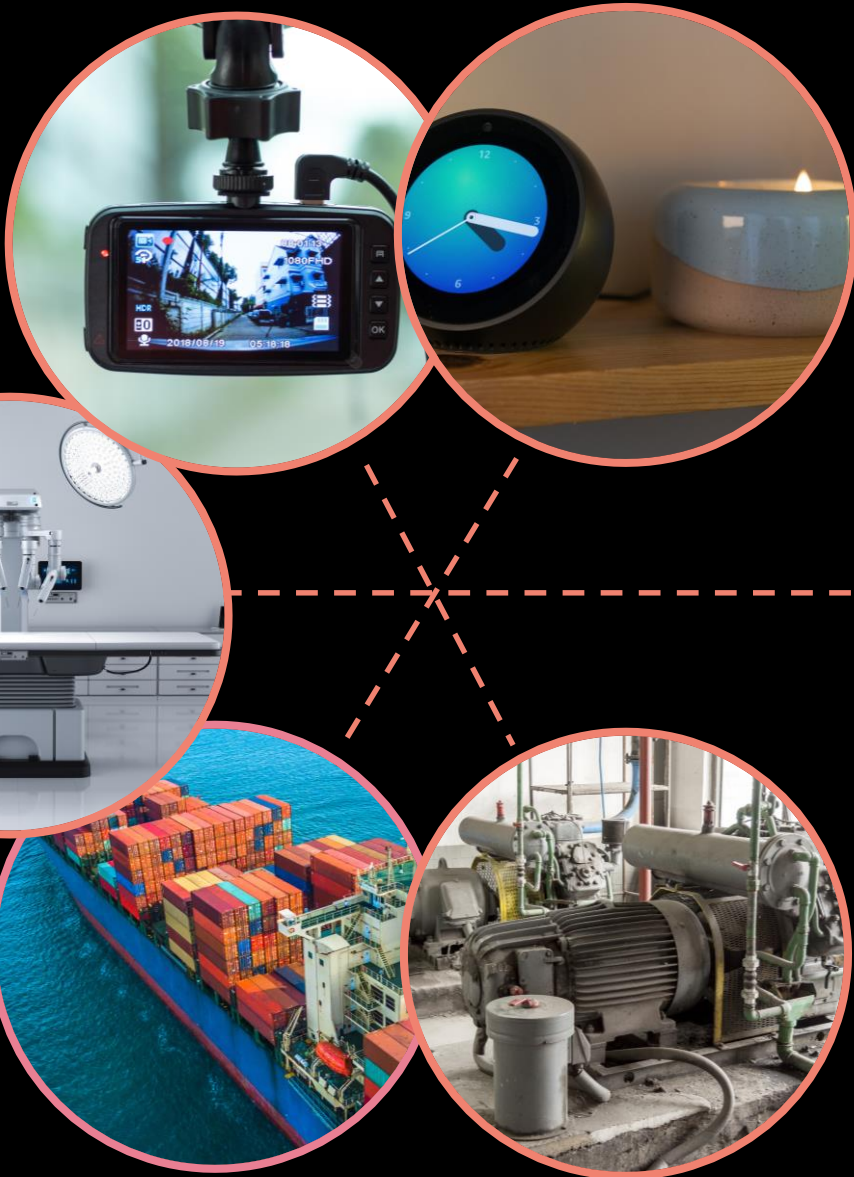


Session focus

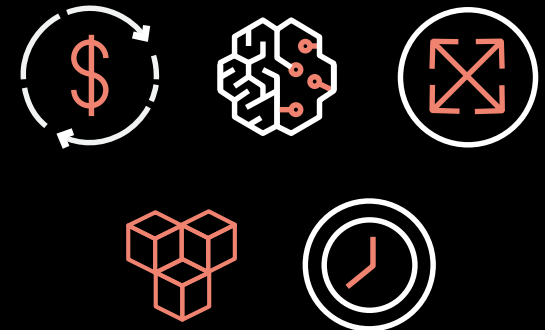
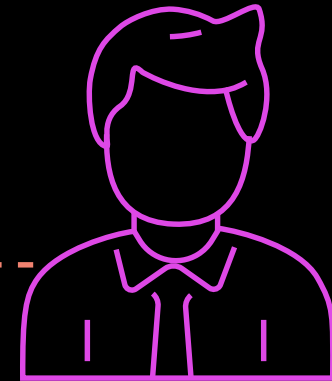
1. What intelligent services can be run on edge locations?
2. Why do we need to run in edge ?
3. Why is it difficult ?
4. Amazon SageMaker Neo and Amazon SageMaker Edge Manager
5. Amazon Lookout for Metrics
6. Demo and other options

What is the edge?

Edge use cases



Why is it important for customers?



What would you do with ML at the edge?



Predictive
maintenance



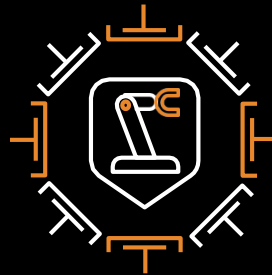
Health and
wellness services



Connected buildings
and city systems



Personalized
computing



Industrial IoT
and robotics



Video
security

Deploying models at the edge



Amazon SageMaker Edge Manager model management for edge devices



Improves performance by up to **25x**

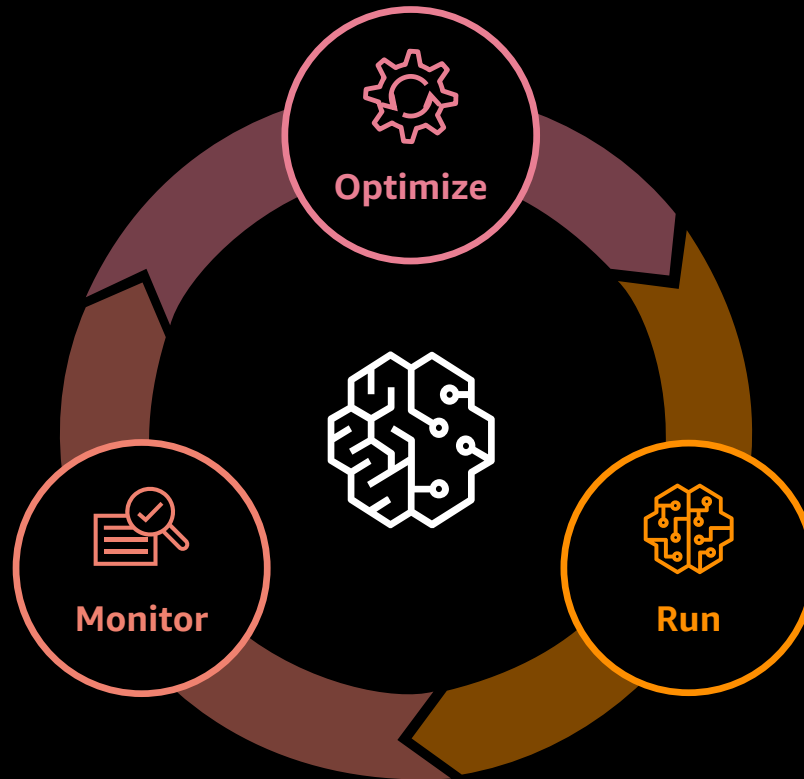
Easy **integration** with device applications

Continuous model **monitoring**

Run **multiple** models on each device

Amazon SageMaker Edge Manager

Prepare models for
deployment at the edge
(Amazon SageMaker Neo)

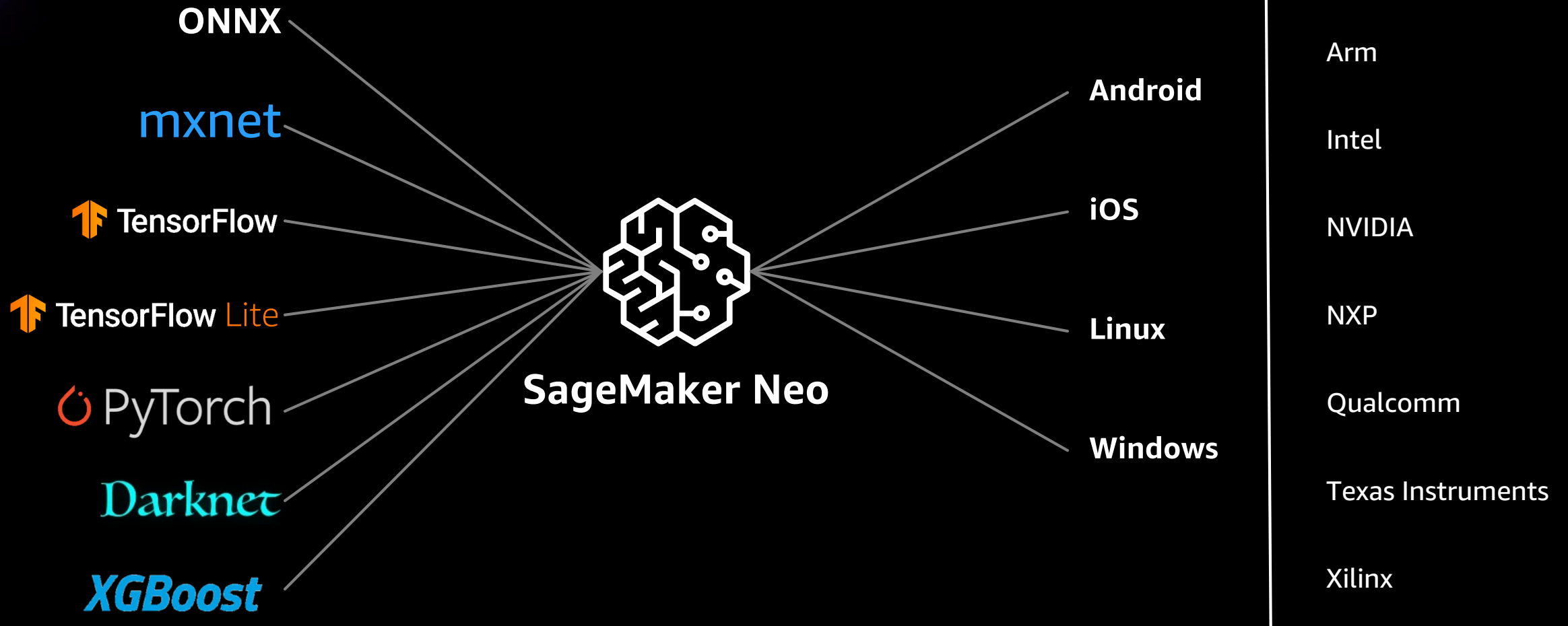


Detect model decay and
improve model quality
(Amazon SageMaker and
other AWS services)

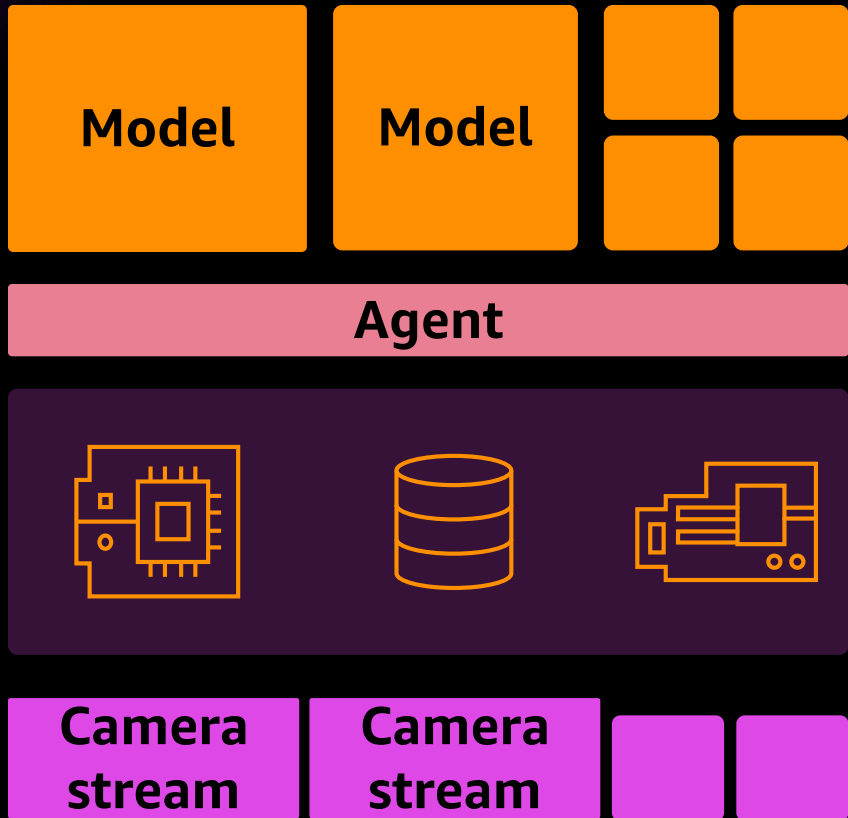
Run one or more models
on each device in a fleet
(Amazon SageMaker Edge
Manager agent)

Amazon Sagemaker Neo: Optimize the models

SAGEMAKER ALGORITHMS

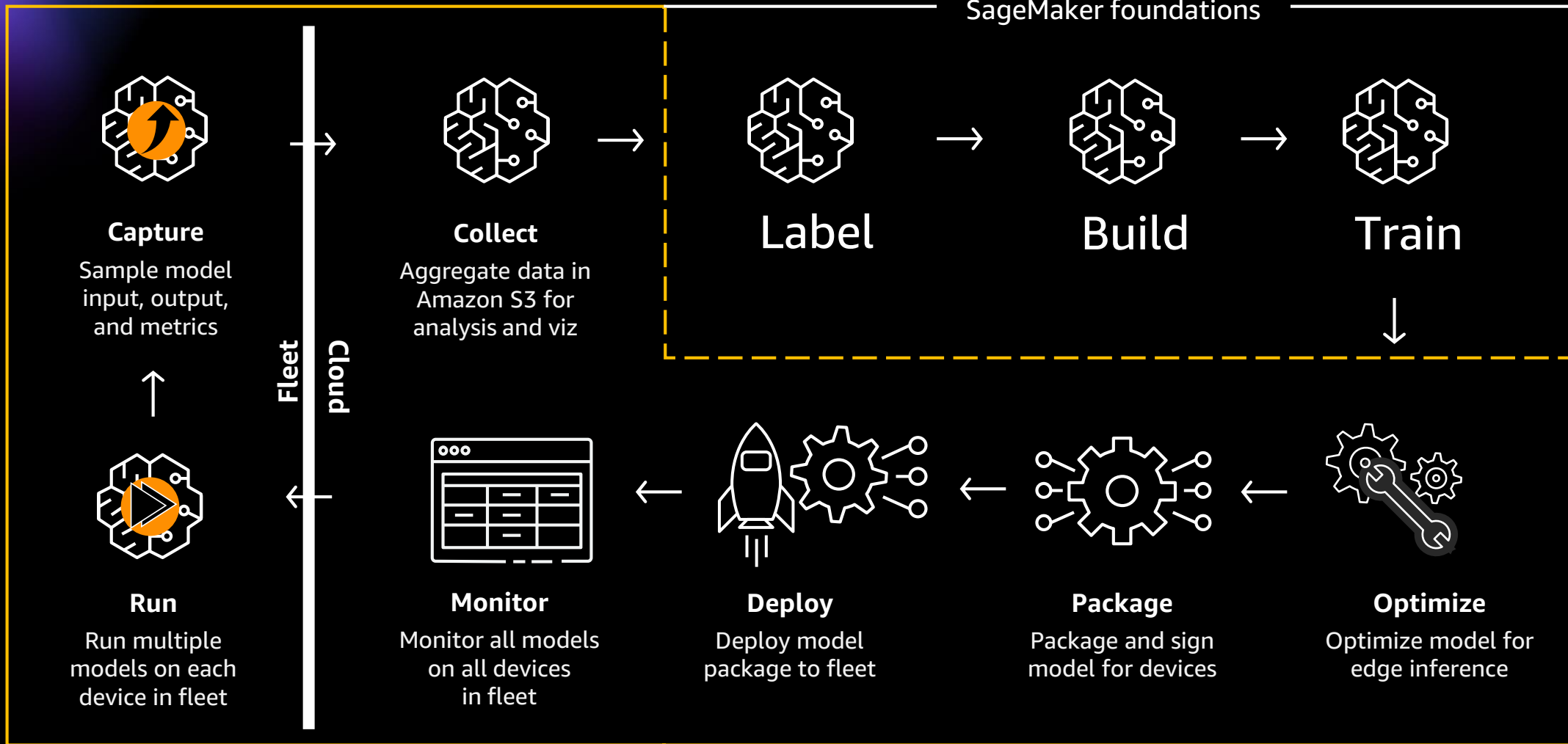


Amazon SageMaker Edge Manager agent: Run the models



- One agent serves multiple models
- The agent consumes <2 MB of memory, freeing up resources for multiple models
- Applications can run multiple models, increasing efficiency

Amazon SageMaker : Lifecycle management



Amazon SageMaker Edge Manager

How do we do it?

How do we do it?



AWS Cloud

1

- Build on Amazon SageMaker
- Bring your own model
- Buy pre-built 3P model/app



How do we do it?



AWS Cloud

1

- Build on Amazon SageMaker
- Bring your own model
- Buy pre-built 3P model/app

2

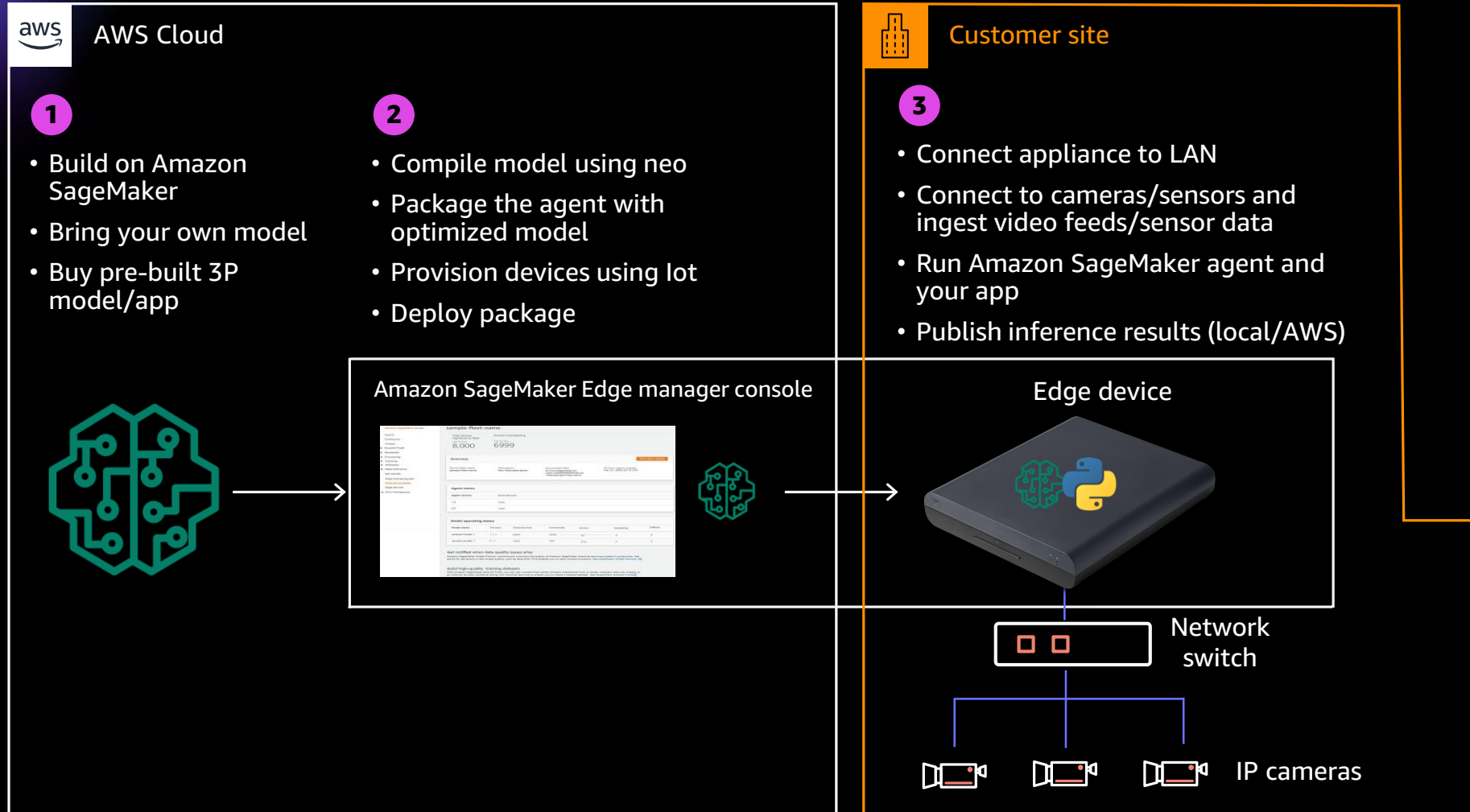
- Compile model using neo
- Package the agent with optimized model
- Provision devices using IoT
- Deploy package



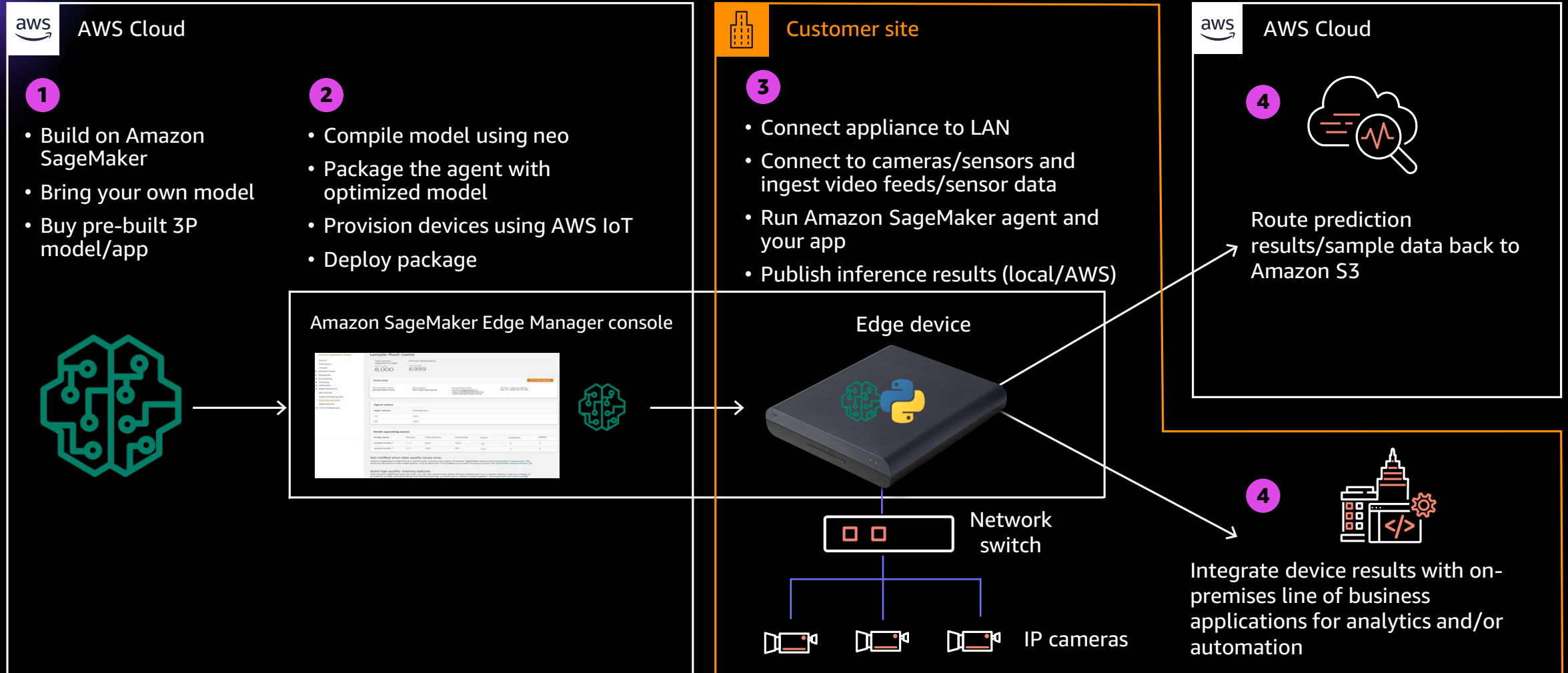
Amazon SageMaker Edge Manager console



How do we do it?



How do we do it?



Demo

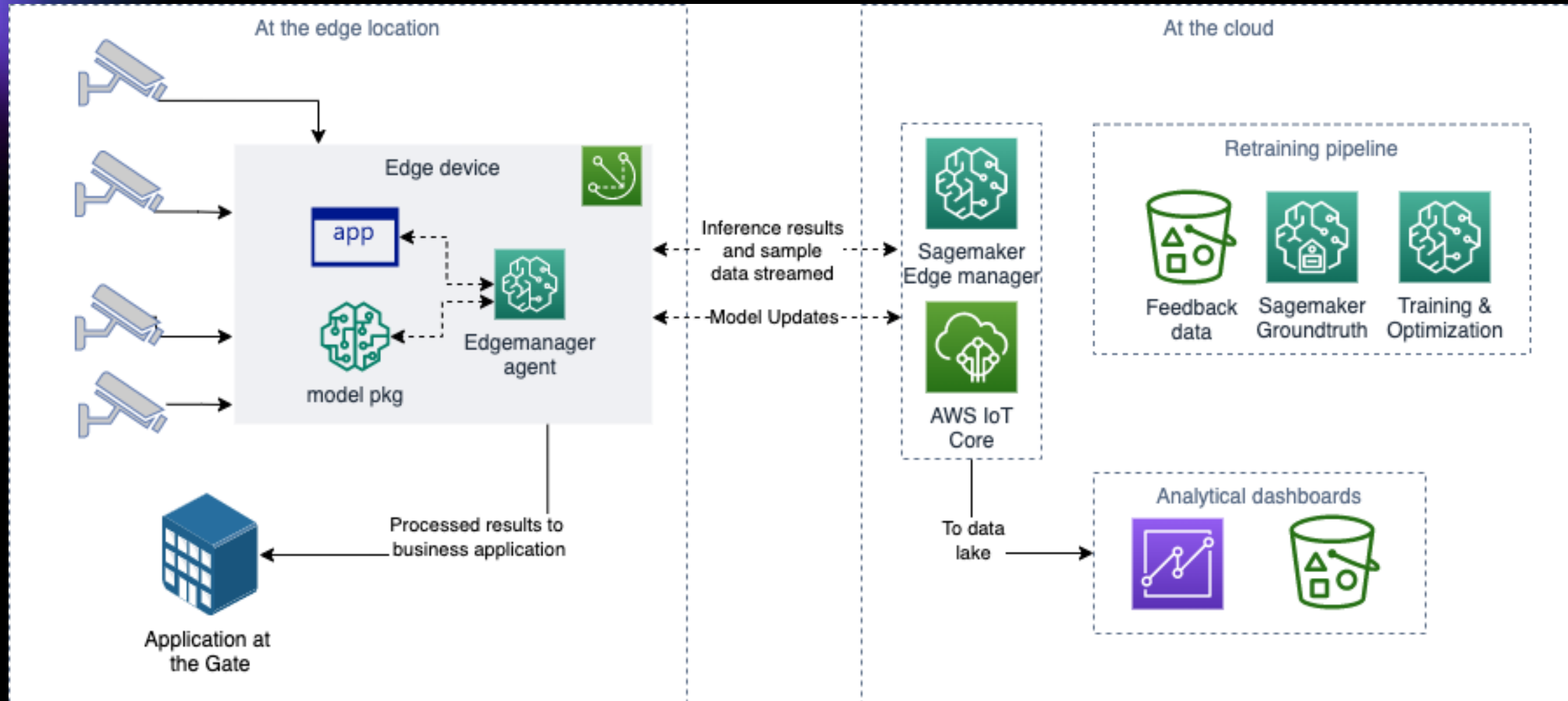


Parking management and real-time monitoring

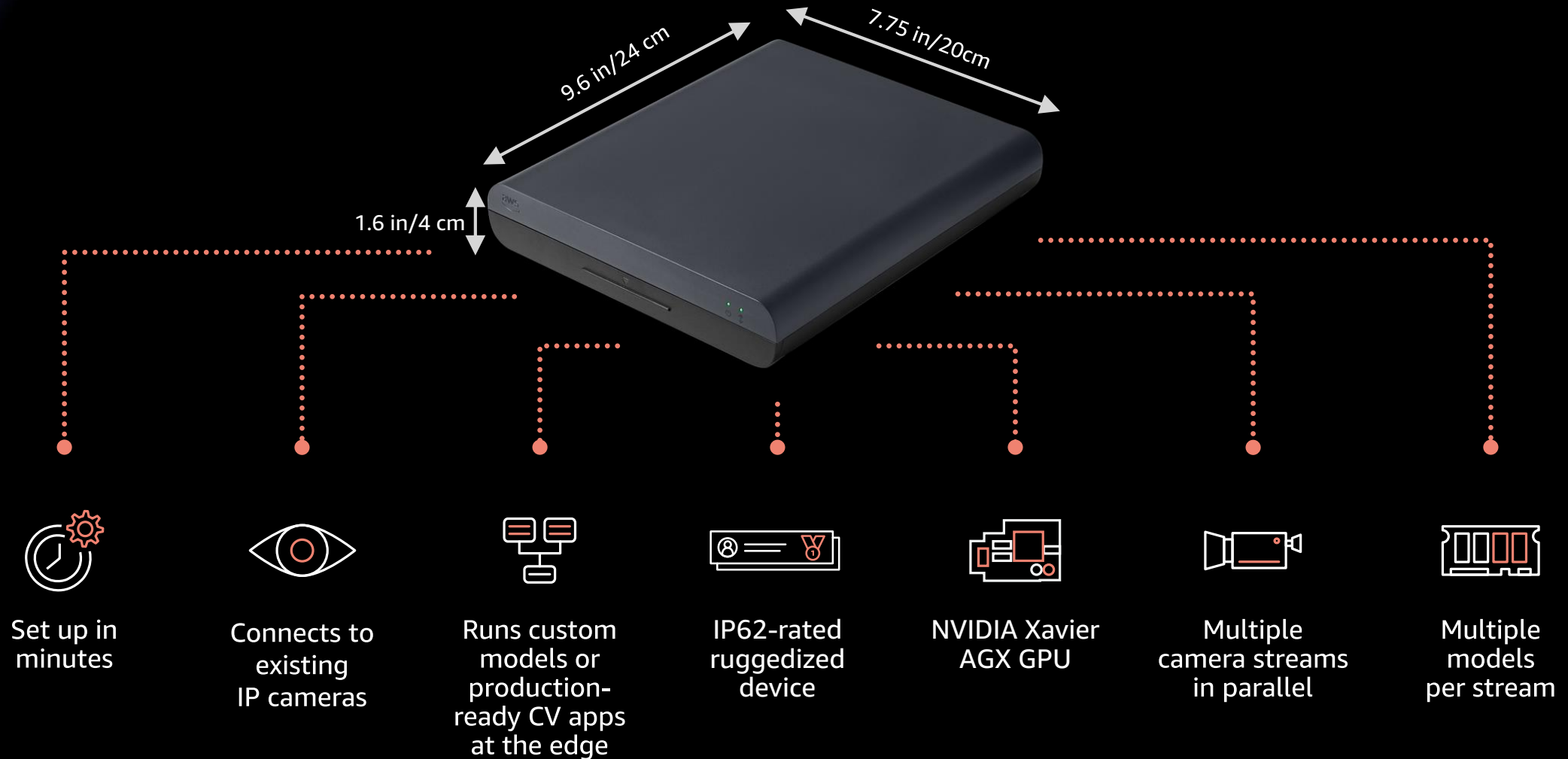
SAMPLE COMPUTER VISION EDGE USE CASE

- License plate recognition
- Vehicle detection and classification
- Safety and security
- Yard management/logistics

Solution at the edge

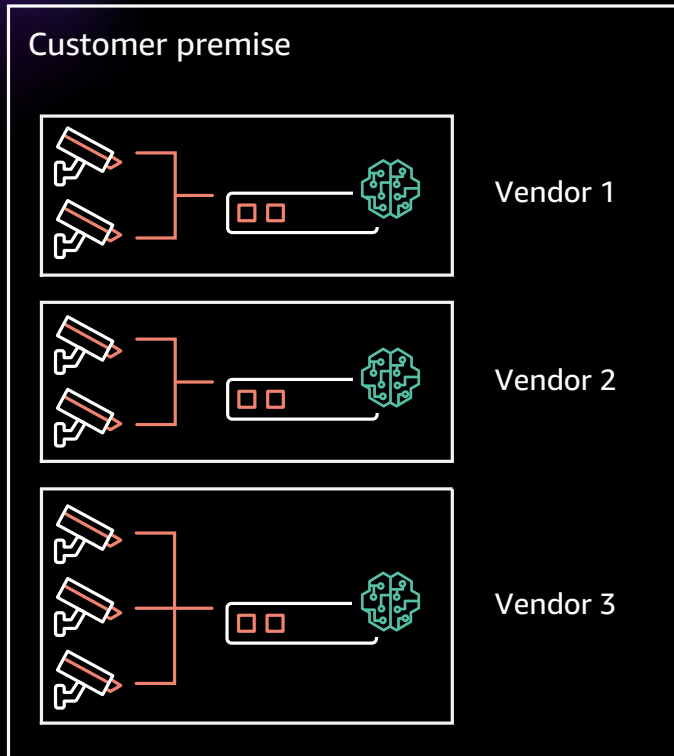


Managed option : AWS Panorama appliance



Edge solutions are hard

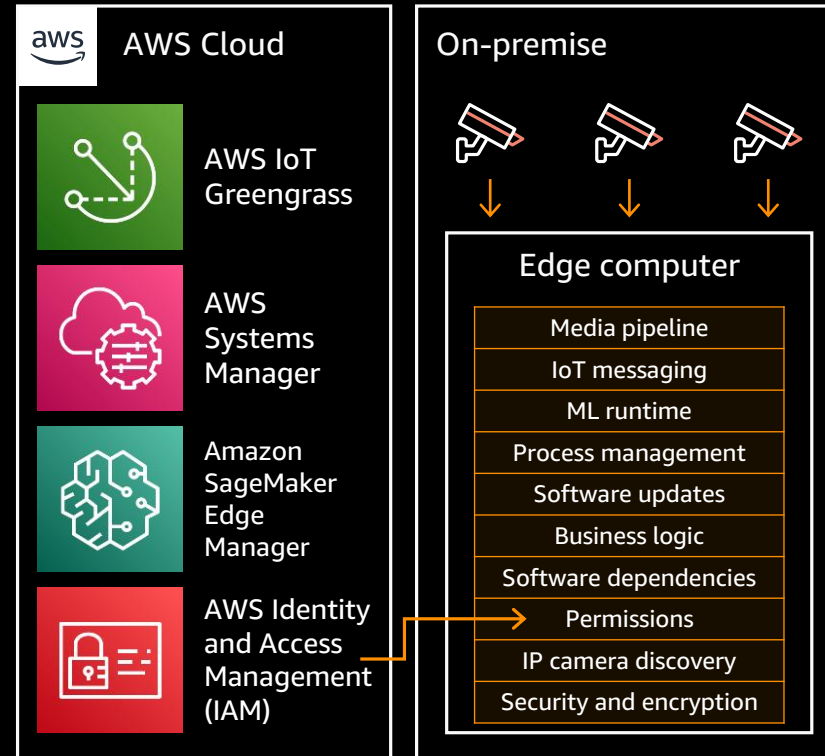
Standalone solutions



✓ Easy to deploy

✗ Closed and proprietary

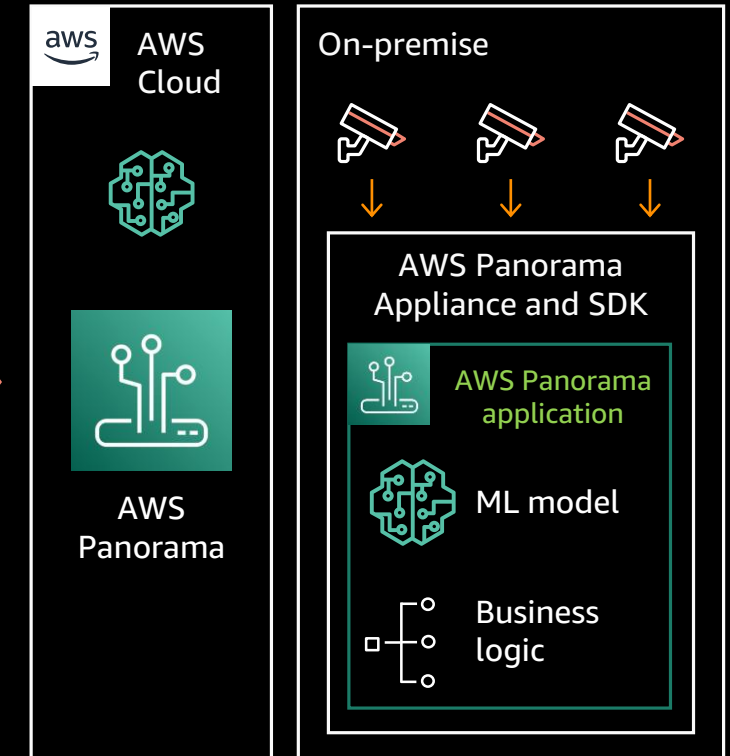
DIY / Unmanaged



✓ Open and flexible

✗ Devices need to be managed

AWS Panorama

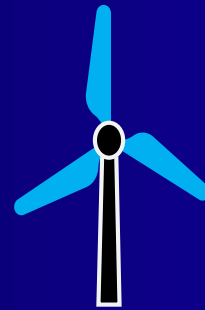
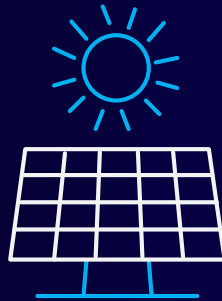


✓ Open and flexible

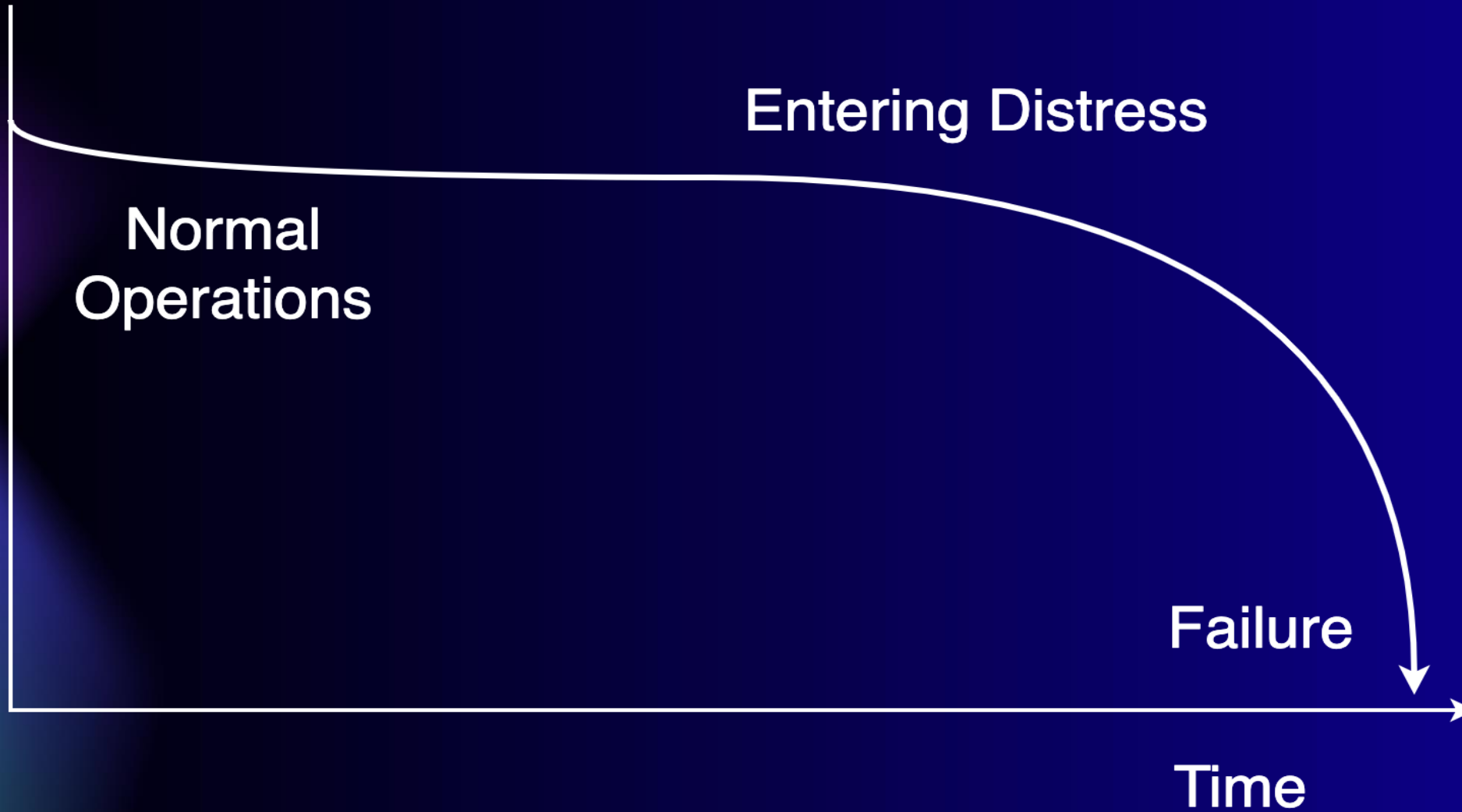
✓ Easier to build and scale

The problem

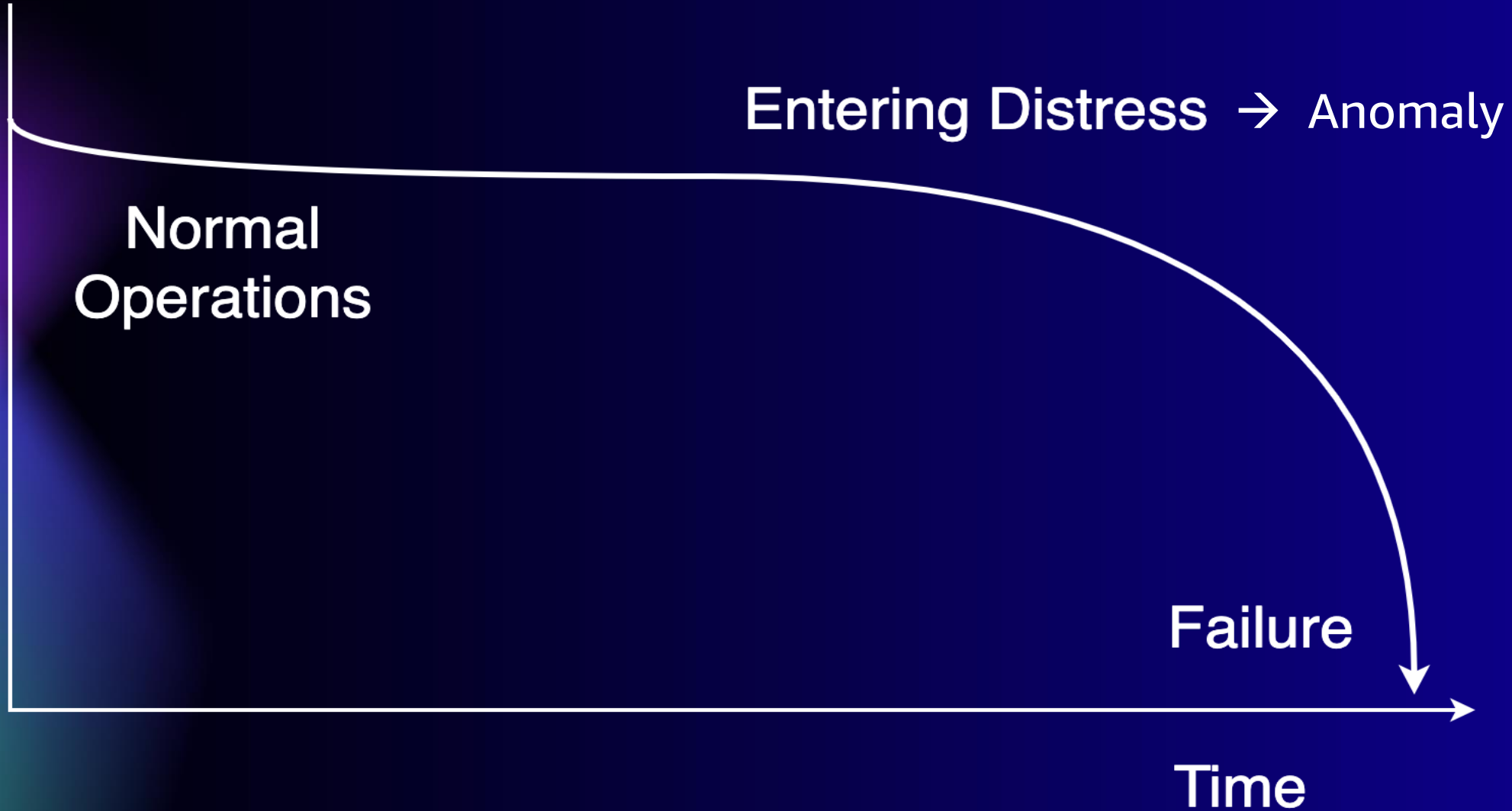
Unplanned downtime is expensive and disruptive



Remaining Useful Life



Remaining Useful Life

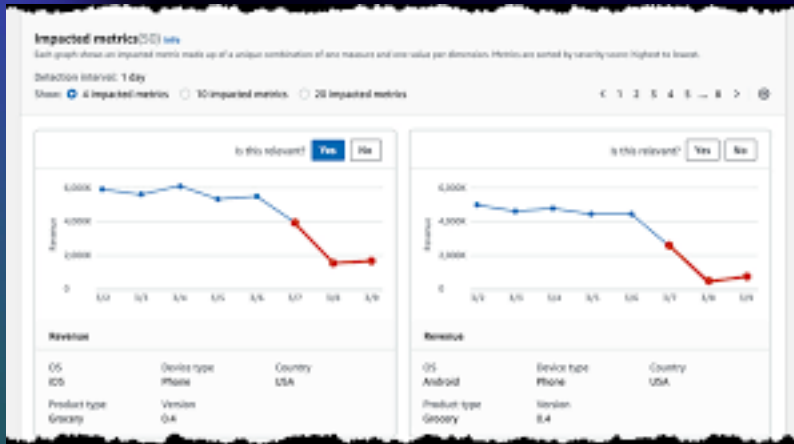


Amazon Lookout for Metrics



Amazon Lookout for Metrics

- Uses machine learning (ML) to automatically detect and diagnose anomalies

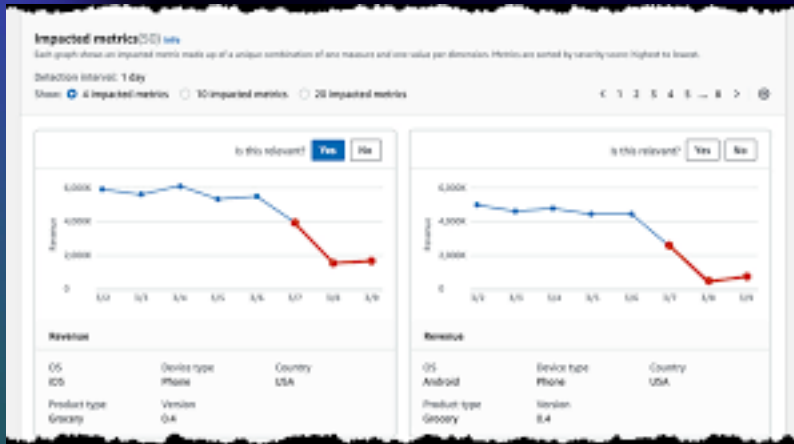


Amazon Lookout for Metrics



Amazon Lookout for Metrics

- Uses machine learning (ML) to automatically detect and diagnose anomalies
- Detect anomalies with greater speed and accuracy

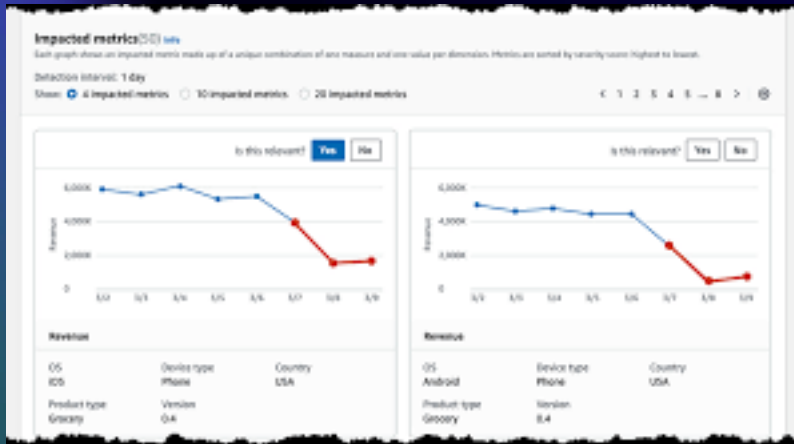


Amazon Lookout for Metrics



Amazon Lookout for Metrics

- Uses machine learning (ML) to automatically detect and diagnose anomalies
- Detects anomalies with greater speed and accuracy
- Provides feedback on detected anomalies to tune the results

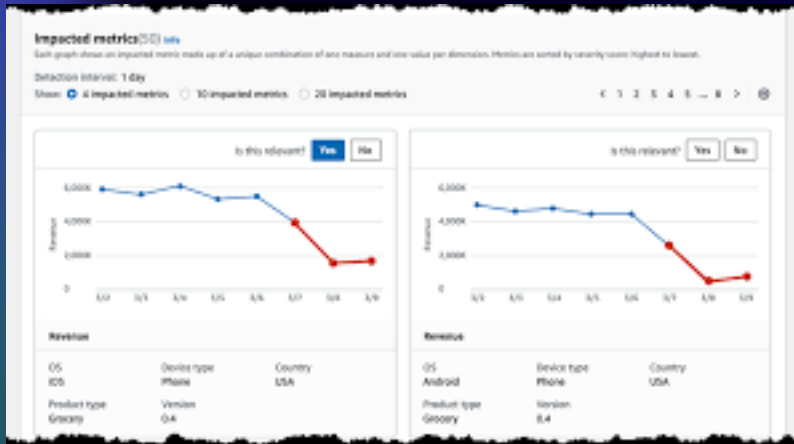


Amazon Lookout for Metrics

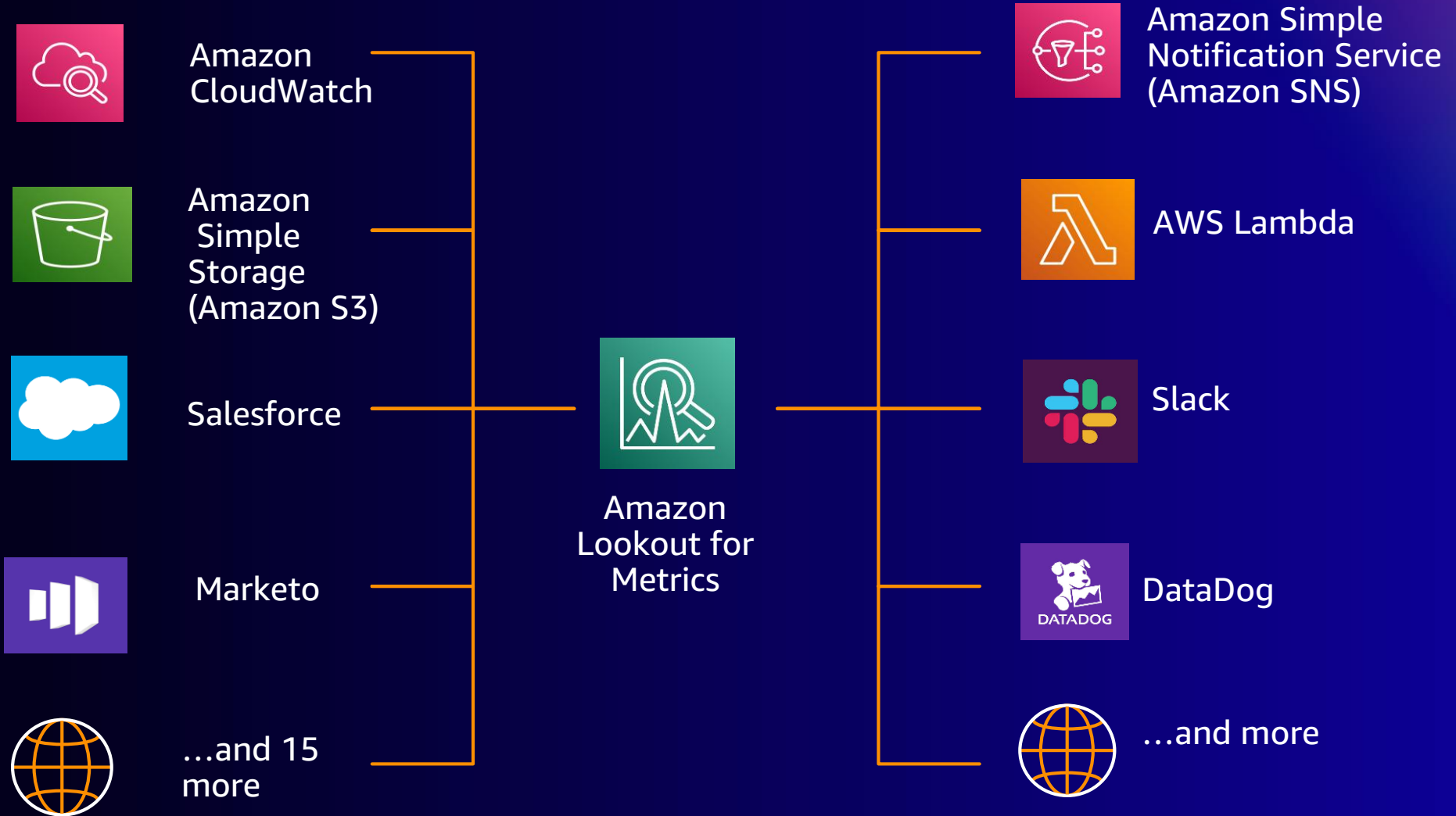


Amazon Lookout for Metrics

- Uses machine learning (ML) to automatically detect and diagnose anomalies
- Detect anomalies with greater speed and accuracy
- Provide feedback on detected anomalies to tune the results
- Configure event and notification services



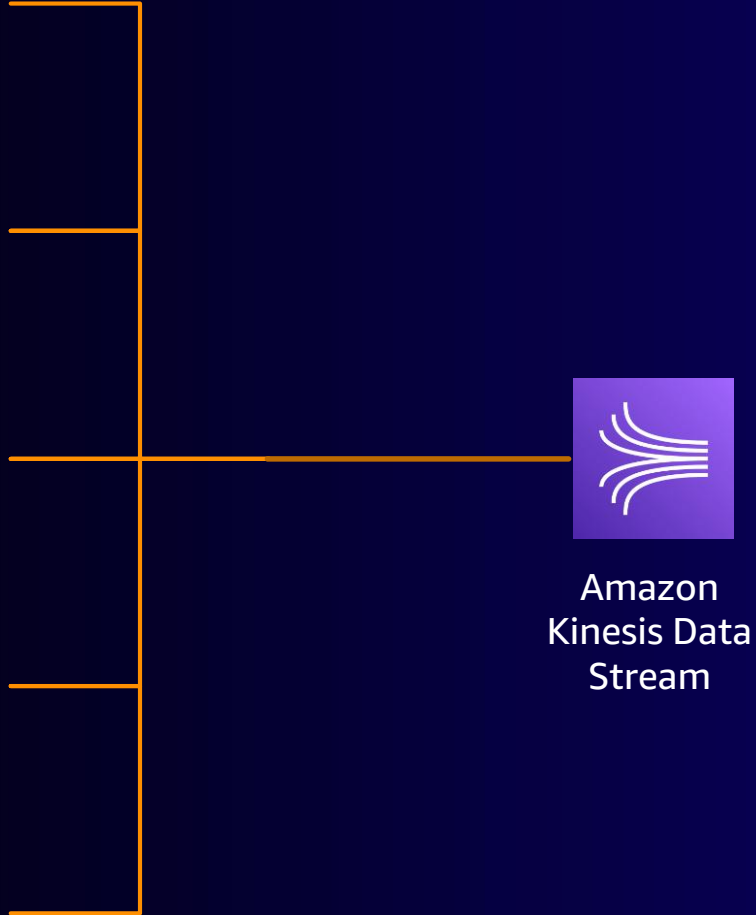
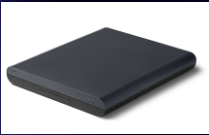
Service integration



Architecture

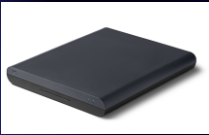


Architecture

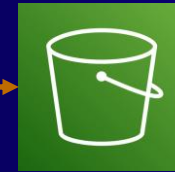


Amazon
Kinesis Data
Stream

Architecture

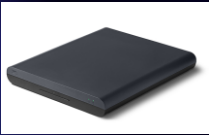


Amazon
Kinesis Data
Stream



Amazon Simple
Storage Service
(Amazon S3)

Architecture



Amazon
Kinesis Data
Stream



Amazon Simple
Storage Service
(Amazon S3)



Amazon
Lookout for
Metrics

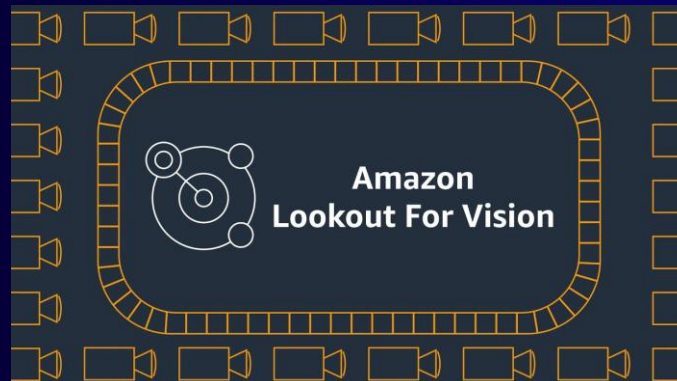


Edge devices

Demo

Other services

Spot product defects
using computer vision to
automate quality
inspection

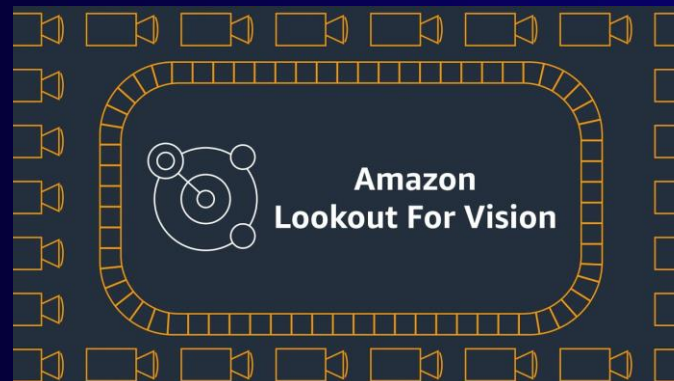


Other services



uses the data from your sensors to detect abnormal equipment behaviour

Spot product defects using computer vision to automate quality inspection

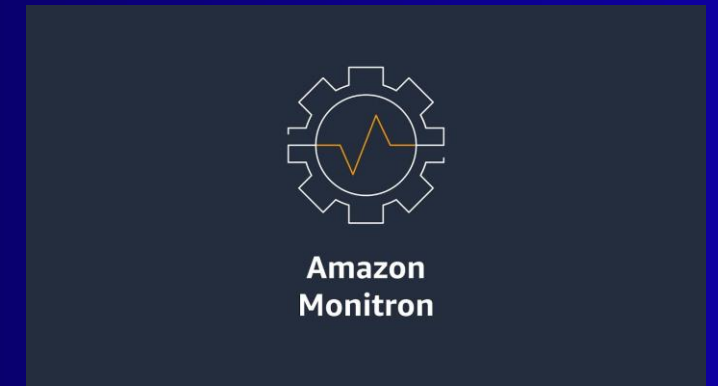
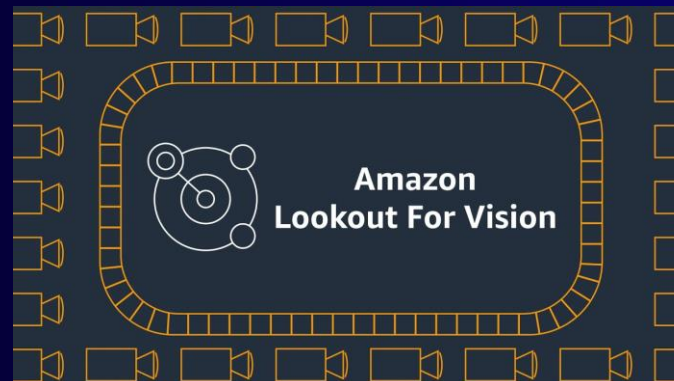


Other services



uses the data from your sensors to detect abnormal equipment behaviour

Spot product defects using computer vision to automate quality inspection



Detect abnormal machine condition proactively and reduce unplanned downtime

Takeaways

- Business will have lot of opportunities running intelligent services at edge
- Running ML @ Edge for thousands of devices is challenging
- Amazon SageMaker Edge manager will make this easier
- Other service which help in the journey
 - Amazon SageMaker Neo
 - Amazon SageMaker Model Monitor
 - Amazon SageMaker Ground Truth and Training
 - AWS IoT Greengrass

Visit the AI & Machine Learning resource hub for more resources

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>

Visit resource hub

AWS Machine Learning (ML) Training and Certification



AWS is how you build machine learning skills

Courses built on the curriculum leveraged by Amazon's own teams. Learn from the experts at AWS.

aws.training/machinelearning



Flexibility to learn your way

Learn online with on-demand digital courses or live with virtual instructor-led training, plus hands-on labs and opportunities for practical application.

explore.skillbuilder.aws/learn



Validate your expertise

Demonstrate expertise in building, training, tuning, and deploying machine learning models with an industry-recognized credential.

aws.amazon.com/certification

Thank you for attending AWS Innovate – AI/ML Edition

We hope you found it interesting! A kind reminder to **complete the survey**.
Let us know what you thought of today's event and how we can improve the event experience for you in the future.



aws-apj-marketing@amazon.com



twitter.com/AWSCloud



facebook.com/AmazonWebServices



youtube.com/user/AmazonWebServices



slideshare.net/AmazonWebServices



twitch.tv/aws

Thank you!

Arun Balaji and Jeeri Deka

