AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

CPG202

Improving product experience and manufacturing

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Agenda

What we are hearing from CPG customers

How AWS can help

Tyson’s computer vision journey

Broader CPG solution framework

How to get started

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What do we hear from our customers?



Consumer engagement

Help me create relevant personalized experiences and optimize my ad spending



Omni-channel experiences

Help me gain control of the brand experience at every touchpoint

Help me achieve ecommerce growth and accelerate direct to consumer



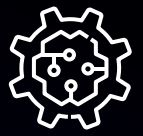
Manufacturing & supply chain

Help me efficiently get my products everywhere consumers want to purchase my brands



Data

Help me break down data silos and integrate all my data so it flows seamlessly across the enterprise



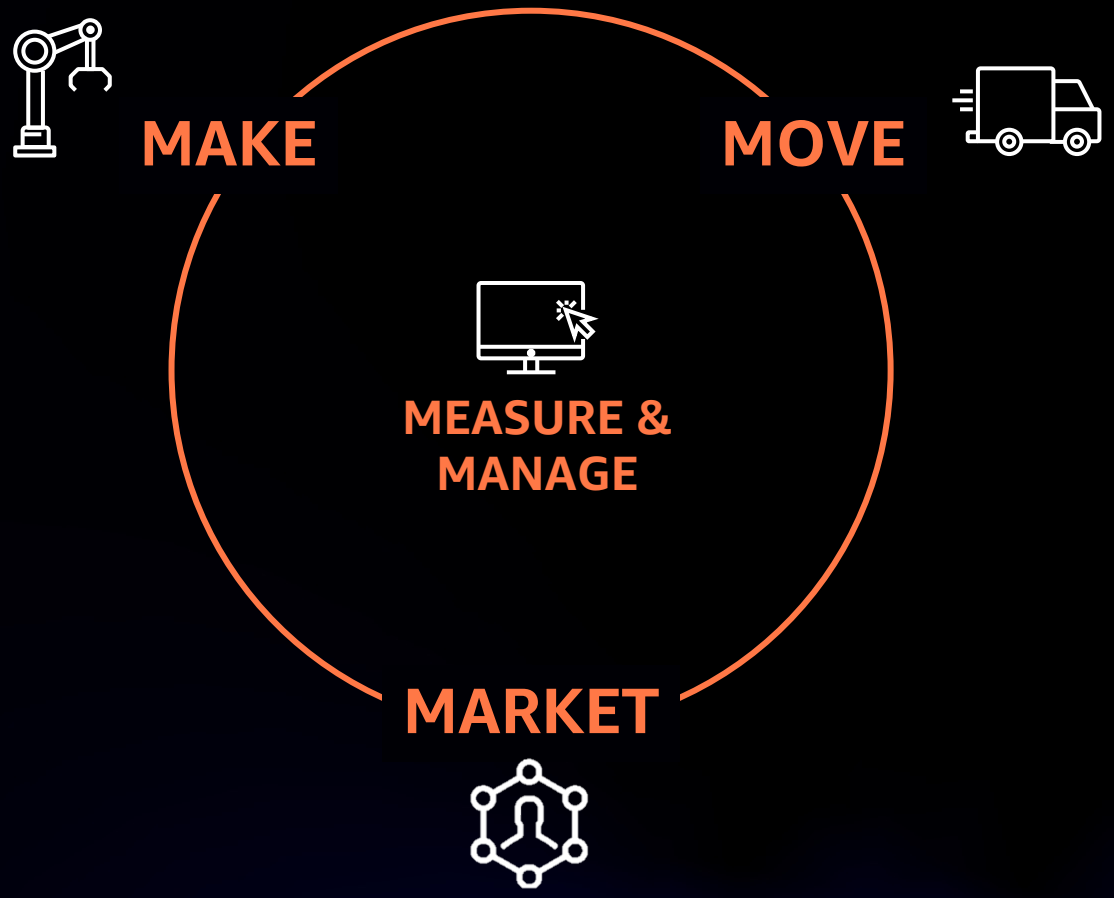
AI/ML

Help me create AI & ML models and analytics applications that automate all aspects of my business

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CPG organizations can innovate in how they delight consumers and grow their loyalty with the help of AWS



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Improving the end-to-end consumer experience

MARKET



Unified commerce
Create a unified commerce experience across digital channels and physical stores

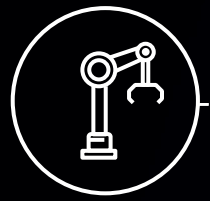
Marketing
Improve marketing efficiency and consumer loyalty

MOVE



Supply chain
Strengthen supply chain resiliency and agility

MAKE



Manufacturing
Reduce the cost of goods sold and improve yield

Product development
Accelerate time to market for new products



MEASURE & MANAGE

IT and digital transformation
Improve decision-making and operational efficiency

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How can IoT impact CPG manufacturing?

- Reduce operating expenses
- Minimize unplanned downtime
- Increase production output
- Improve safety and environment

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Industrial computer vision

The journey from PoC to enterprise scale



Jeremy Gerard

Lead Developer – IT Emerging Technology
Tyson Foods, Inc.

THE PROTEIN COMPANY™

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Agenda

1. **Setting the stage**
   How computer vision (CV) can help feed the world

2. **Starting a computer vision journey**
   Cracking eggs to make an omelet

3. **An AWS-empowered transformation**
   Standardizing an emerging technology

4. **The results**
   Accelerating innovation and modernizing industry

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Feeding the World

BEEF	PORK	CHICKEN	PREPARED FOODS
155,000	461,000	45,000,000	74,000,000
HEAD PER WEEK CAPACITY	HEAD PER WEEK CAPACITY	HEAD PER WEEK CAPACITY	POUNDS PER WEEK CAPACITY
77%	90%	84%	81%
AVG. CAPACITY UTILIZATION	AVG. CAPACITY UTILIZATION	AVG. CAPACITY UTILIZATION	AVG. CAPACITY UTILIZATION
12	7	185	35
FACILITIES[1]	FACILITIES	FACILITIES[2]	FACILITIES[3]

Facilities totals do not include livestock grower farms. Some facilities make products that are reported in multiple segments. For presentation purposes, facilities are reflected in the segment that had the majority of the facility's production. Capacity per week is based on the following: Beef and Pork (six day week) and Chicken and Prepared Foods (five day week).
Capacity per week at year end is affected by acquisition and diversities during fiscal 2020. Average capacity utilization is based on capacity available throughout the year.

[1]The Beef segment includes 3 case-ready locations that share facilities with the Pork segment.

[2]Chicken facilities include processing plants, rendering plants, blending mills, feed mills, grain elevators and broiler hatcheries. The Chicken segment includes 2 locations that share facilities with the Prepared Foods segment.

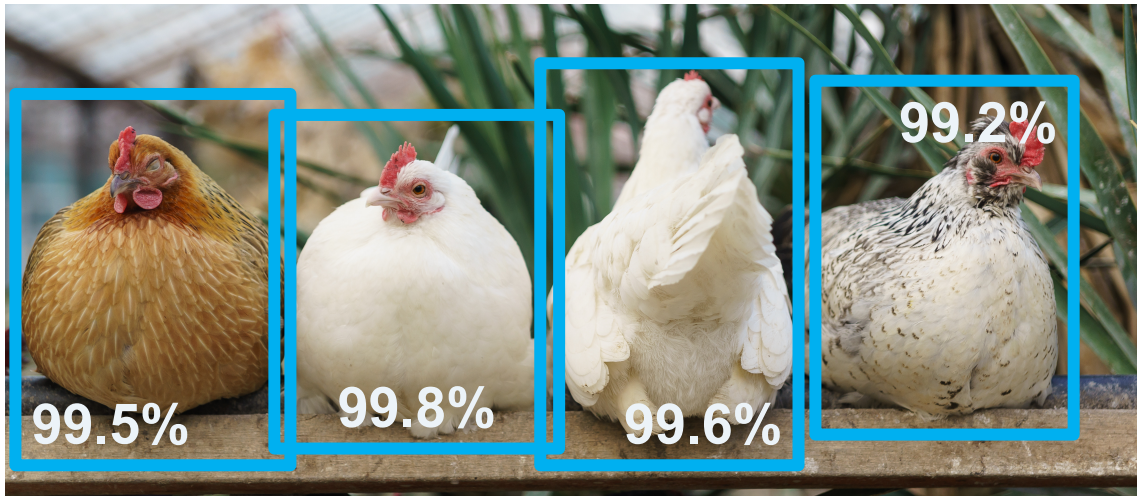
[3]Prepared Foods facilities include a pet treat production plant and a vertically-integrated turkey operation. The Prepared Foods segment includes 5 locations that share facilities with the Chicken segment.

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Tyson

CV at Tyson: Value proposition

- ☑ Improve OEE and operational excellence
- ☑ Assure customer satisfaction
- ☑ Protect team member experience and safety
- ☑ Create predictive and prescriptive analytics

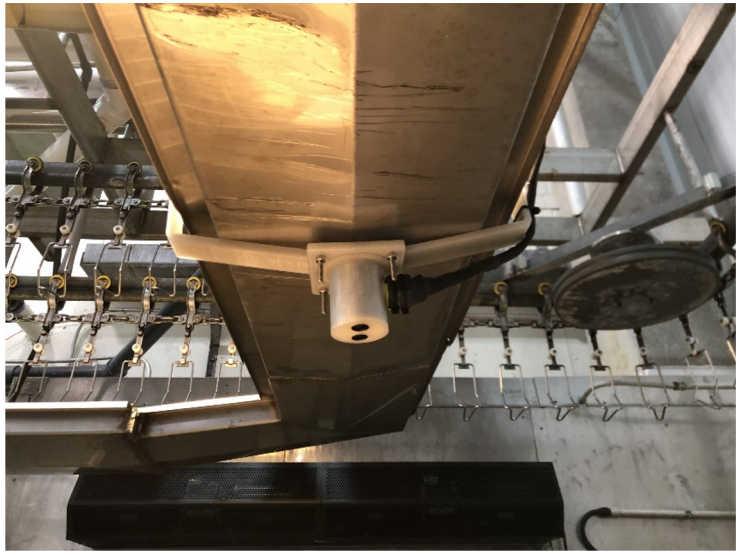


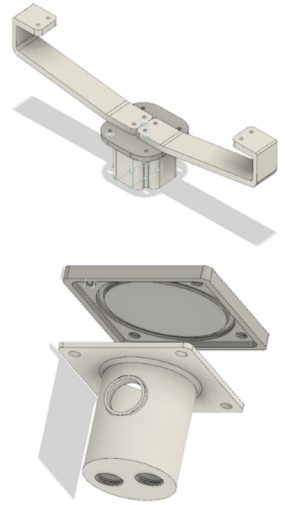
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Starting a CV journey

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Automated inventory management







PoC

Poultry product identification

The plan

1. Install a camera over the yield scale to provide the operator with direct visibility to the product
2. Collect images to train and deploy a model to identify product automatically

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The start of our collaboration





Goals

1. A sustainable, streamlined way to handle data labeling
2. An integrated pipeline to manage images and data through model training and deployment

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Labeling a dataset



Amazon SageMaker Ground Truth

Built custom interface

- 29 lines of HTML

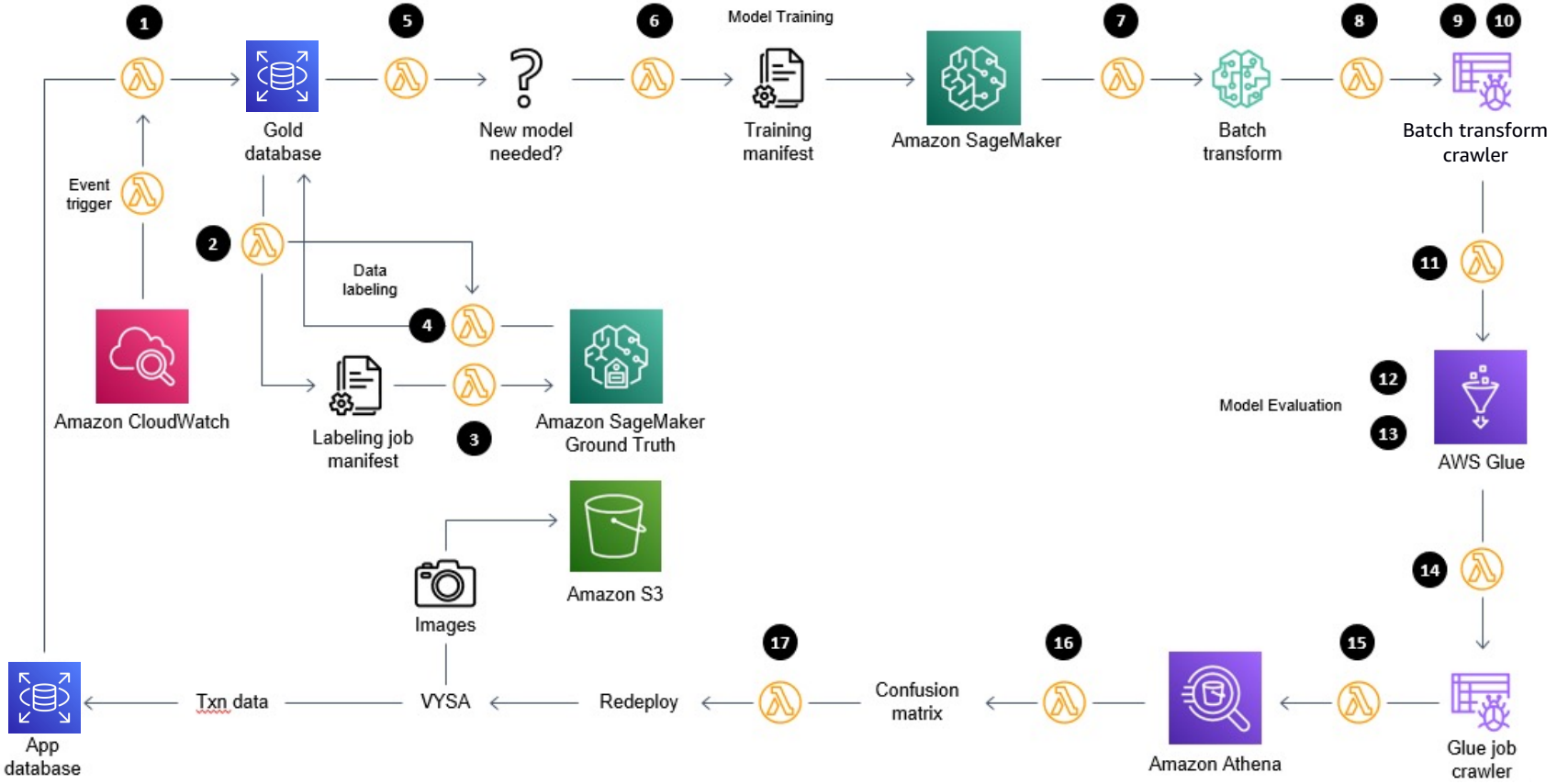
Private workforce

- 6 people in ~4 hours to label thousands of images across 120 classes

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Custom ML pipeline



Amazon SageMaker

- AWS Step Functions
- AWS Lambda functions
- AWS Glue
- Amazon Athena
- Amazon RDS
- Amazon ECR
- Amazon CloudWatch

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Vision realized . . . ?

2018: Pilot started

2019: Pilot deployed

2020: *The Wall Street Journal* article, “Tyson Takes Computer Vision to the Chicken Plant,” is published

2021: Still struggling to hand off support ☹

https://www.wsj.com/articles/tyson-takes-computer-vision-to-the-chicken-plant-11581330602

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“The best way to fail at inventing something is by making it somebody’s part-time job.”

Dave Limp, SVP, Devices & Services at Amazon.com

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An AWS-empowered transformation

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Transformation areas

Software



Hardware

IT ops

Culture & philosophy

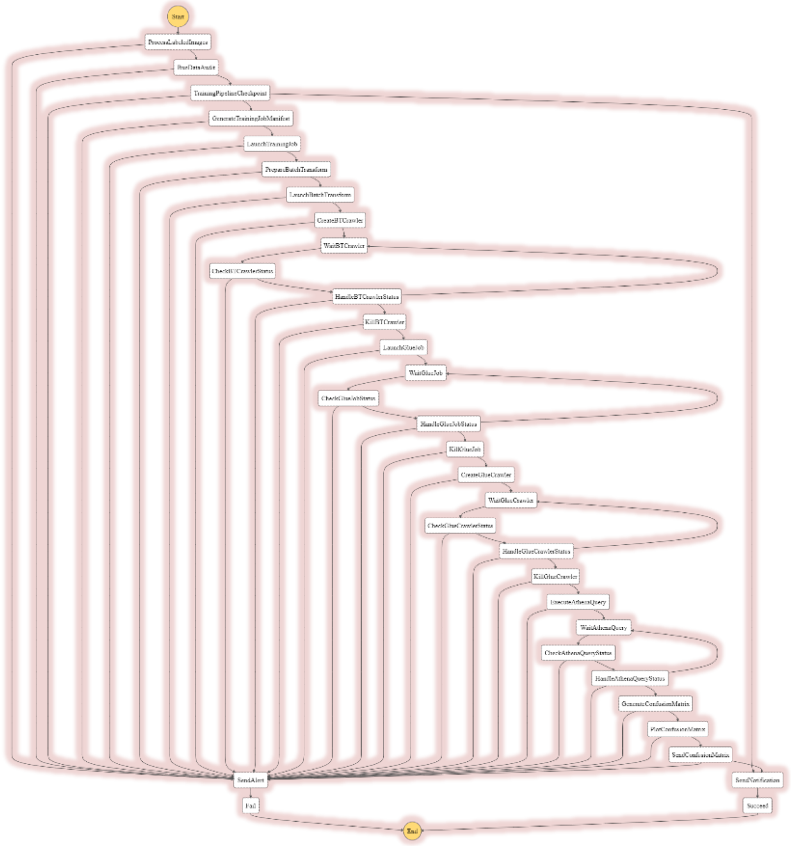
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Software transformation

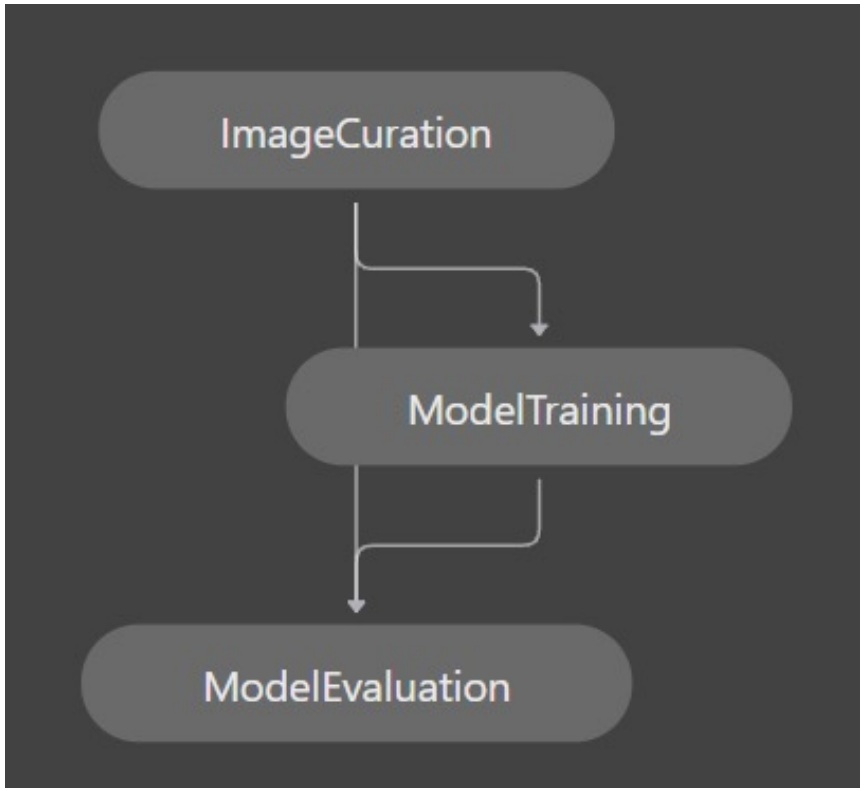
Before

AWS Step Functions



After

Amazon SageMaker pipelines



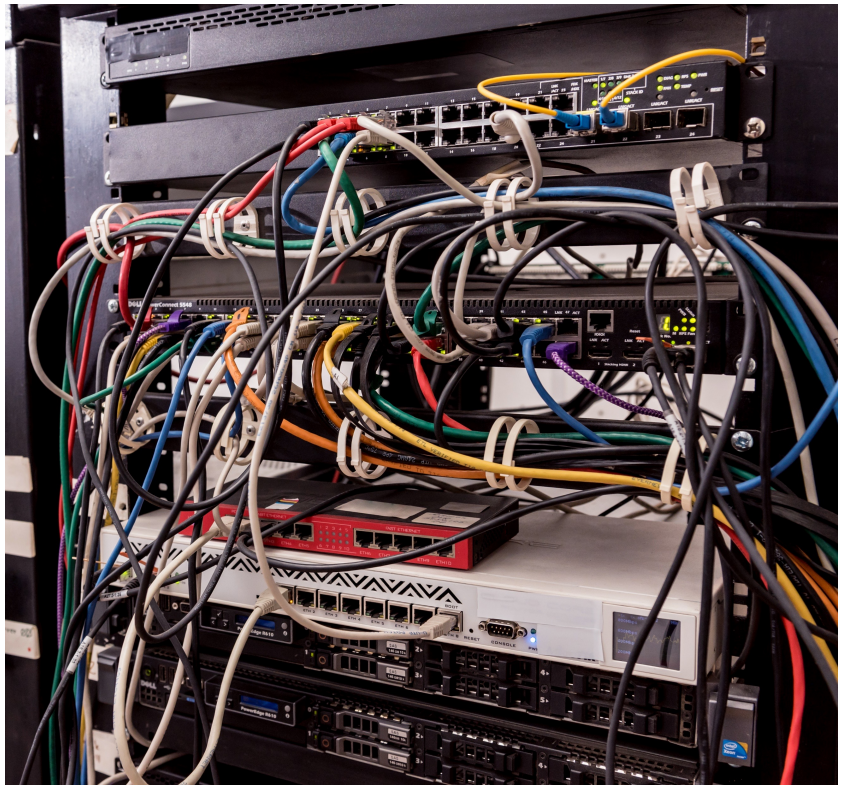
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Hardware transformation

Before

Kubernetes cluster on an Ubuntu VM
on a Dell blade in a server closet



After

AWS Panorama



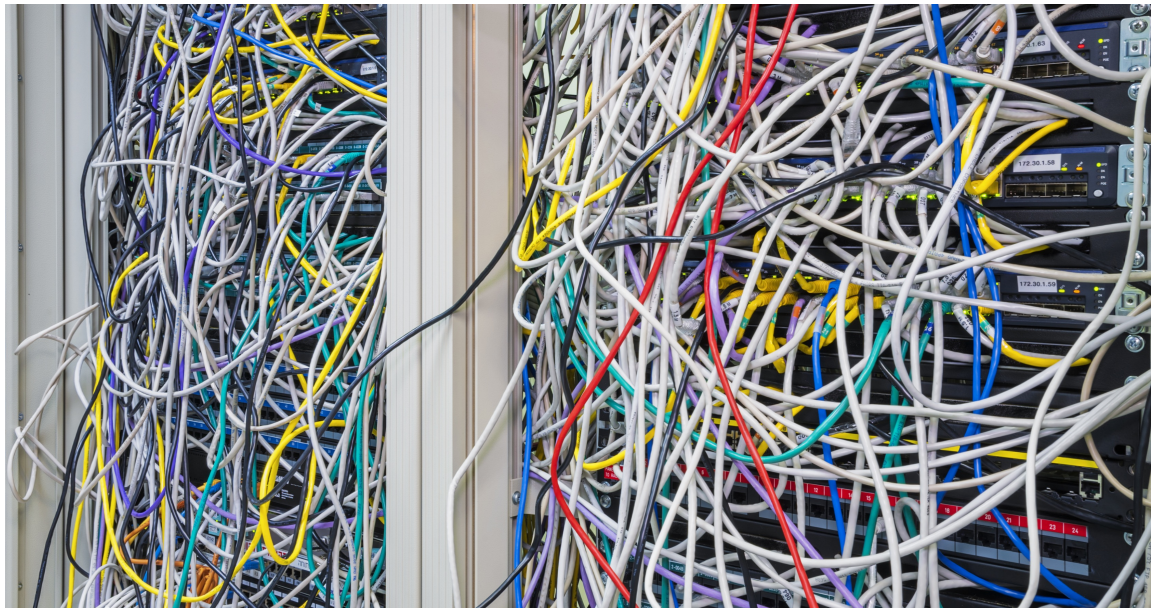
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IT ops transformation

Before

- Complex, inefficient processes for testing, debugging, etc.
- Customized application-specific solutions



After

- Streamlined DevOps/MLOps
  - Nimble, short-cycle CI/CD
  - Version control for code, data, models
- Serverless architecture; managed services
- Repeatability, supportability, scalability



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IT culture & philosophy



Borrowed from AWS

- Two-pizza teams
- Single-threaded leader
- PoC → pilot → fit for scale
- Narrative, PR/FAQ, path to production

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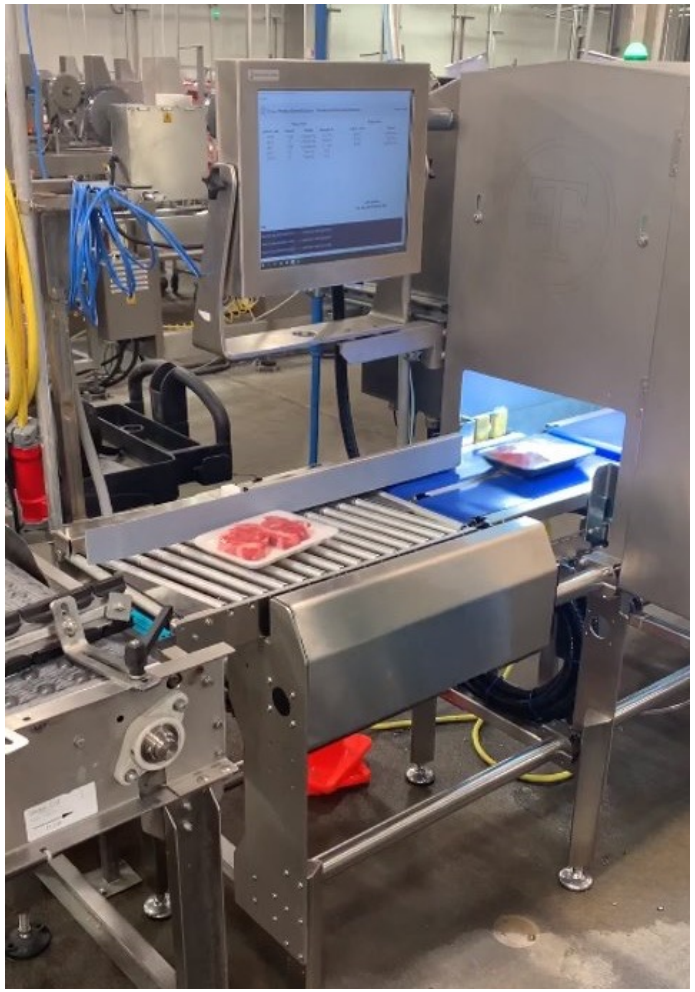
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The results

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Beef product identification

49 beef products belonging to 20 beef products groups



The results

5/24–5/27, 7 shifts

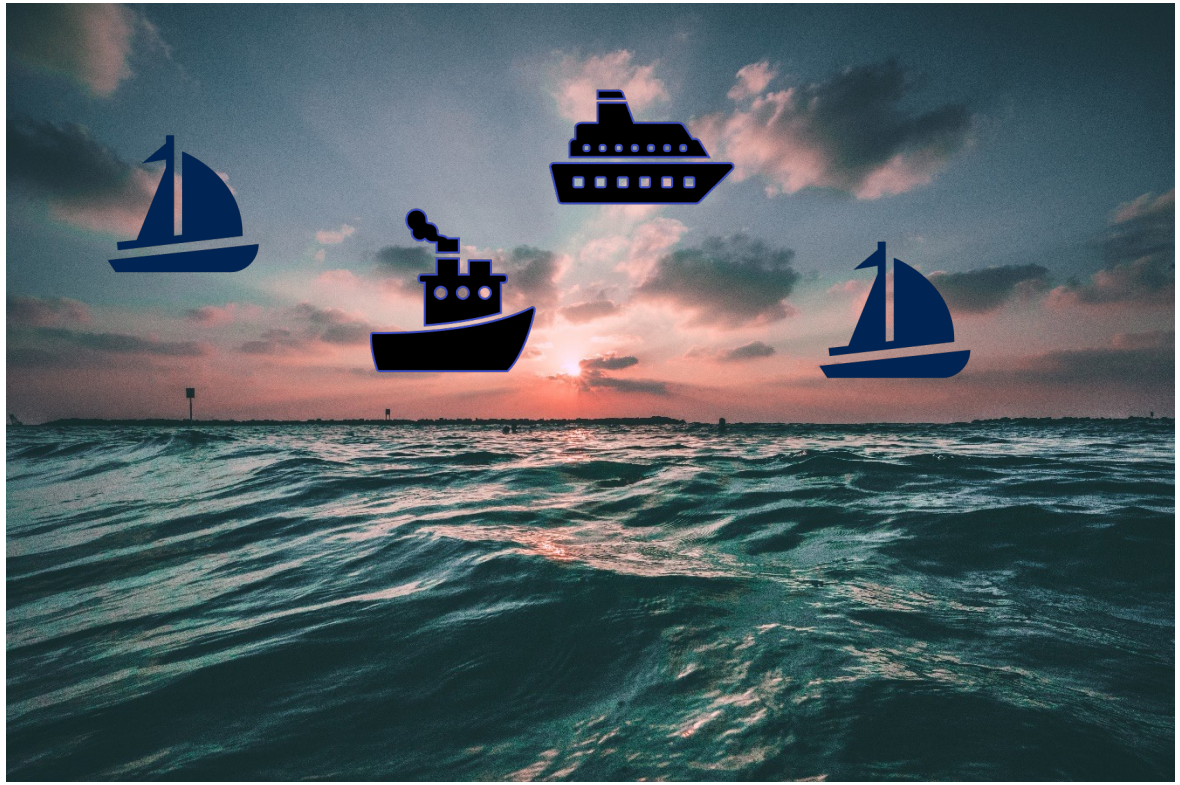
Total tray#	Correct %	Incorrect %	Rework %	Average inference time (in ms)
60745	99.89%	0.00% (1 tray)	0.11% (64 trays)	75

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A rising tide lifts all ships

- Ability to implement and scale more CV solutions, faster
- Simple, modularized solutions
- Easier to hand off and support
- Enable other teams to use the same architecture to apply to other use cases



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Broader CPG solution framework

Justin Honaman
Worldwide CPG Go-to-Market
AWS

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Transformation prioritization



- Need to personalize ads and increase return on ad spend
- Want to grow 1P data with direct-to-consumer experiences
- Acceleration in new B2B Retail-CPG data, experience, execution solutions
- Need more efficient manufacturing and higher quality while reducing cost
- Need better, actionable insights with ever-increasing data sets
- Leverage evolving AI/ML capabilities
- Need to deploy and report on sustainable solutions
- Need supply chain visibility, leverage industrial IoT capabilities
- Drive profitable new growth based on innovation, M&A, global growth

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Fueling CPG solution innovation



Personalized Ads



Mobile and Web Retail



Physical Stores



Direct to Consumer



Manufacturing



Brand Feedback



Brand Innovation



Sustainable Solutions



Supply Chain and Delivery

Unlock Desires

Customer engagement

Seamless Omni-channel Experiences

Ai-driven Supply Chain

Ai-driven Manufacturing Systems

Modernize Legacy IT Services

Ai-driven Brand Innovation

Sustainable Products

Multi-channel Fulfilment

Deliver Smiles

Full Funnel Analytics
Omni-Channel Ads
Syndicated/Consumer

Consumer 360
DTC Launchpad
Headless Commerce

Forecast
OTIF Reduction
Visibility

Digital Twin
Predictive Maint.
Connected Factory

Virtual Data Center
Cross-Org Data Mesh
Data Integration

Cause and Effect
Fast Experimentation
Connected Products

Sustainable Packaging
Reverse Logistics
Contact Center

Outlet Execution
Last Mile Delivery
Contact Center

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New tech meets legacy CPG challenges



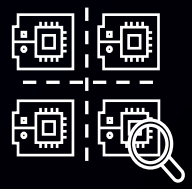
Engineering & design

- Accelerate time to market
- Lower infrastructure costs
- Improve collaboration



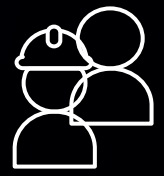
Production & asset optimization

- Lower costs (energy, machines, labor)
- Improve machine or asset productivity
- Reduce production downtime



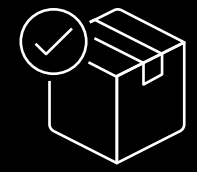
Quality management

- Automate quality inspection
- Improve inspection accuracy
- Reduce product defects



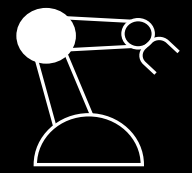
Worker Productivity

- Improve employee productivity
- Reduce worker injuries



Supply chain management

- Improve forecast accuracy
- Reduce inventory costs
- Improve capacity utilization
- Reduce OTIF fines / costs



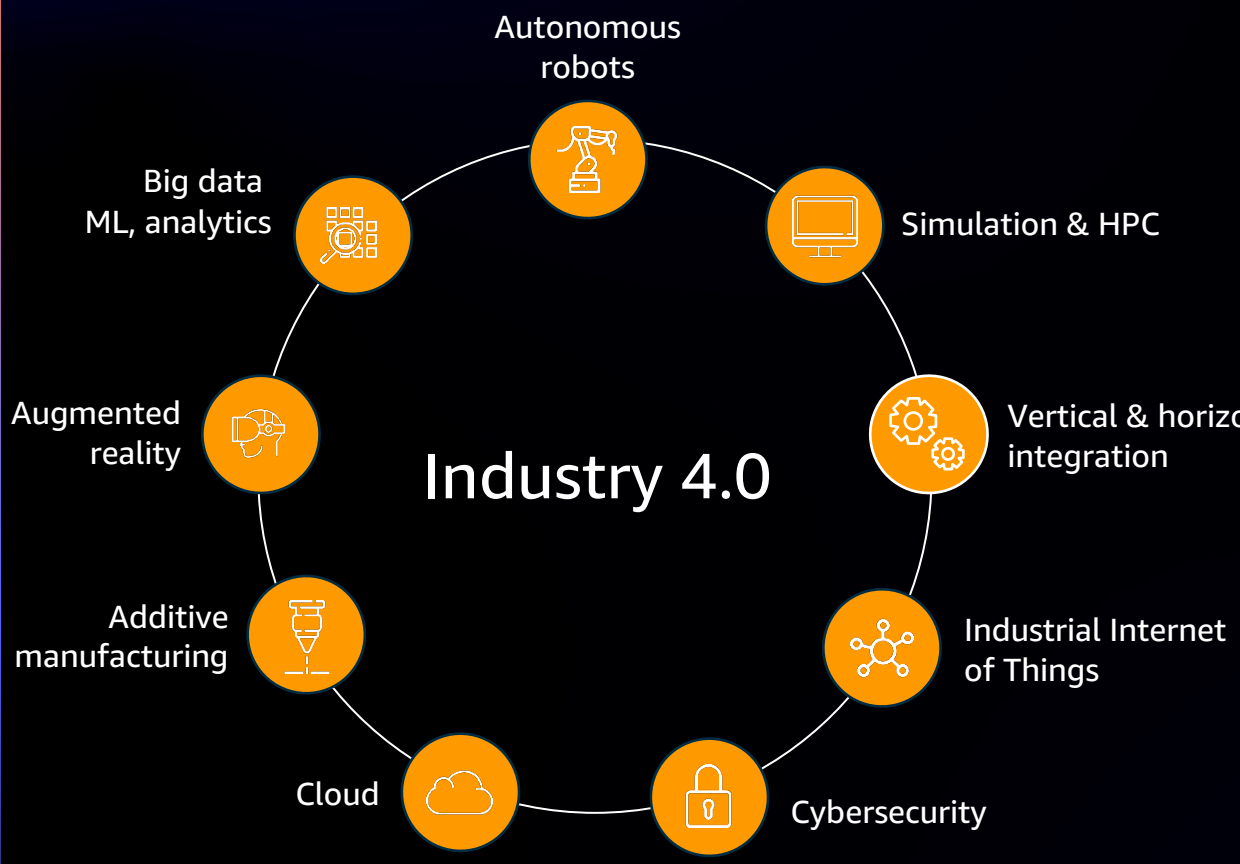
Smart products & machines

- Enhance user experiences
- Create new revenue streams
- Improve product or service quality

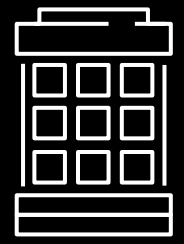
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CPGs demand flexibility and agility



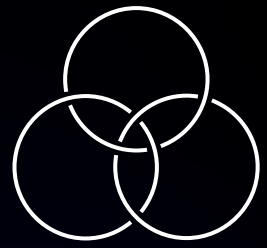




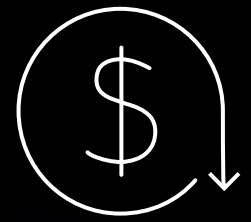
Run workloads on premises, connected and disconnected



Run workloads in the cloud



Provide tight integration



Leverage skills and resources

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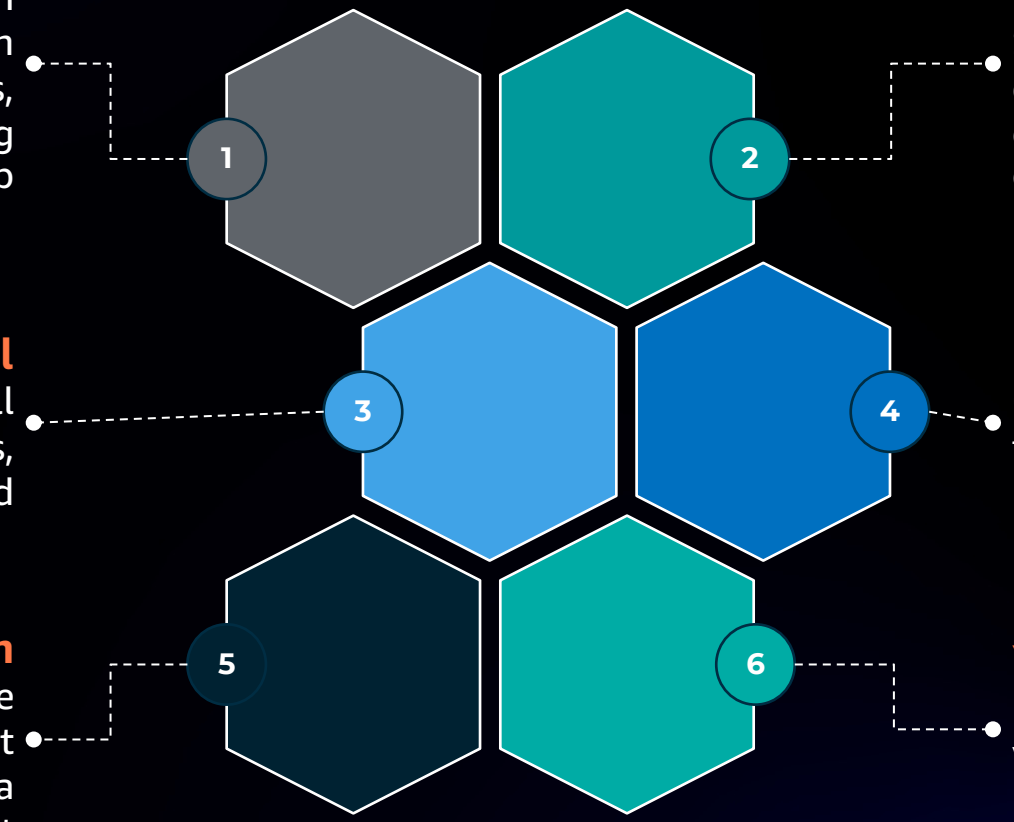
Computer vision value realization

Suggested use cases

Automated packaging inspection
Inspection of raw packing materials such as glass vials, which require verification for imperfections such as air bubbles, cracks or small fissures prior to moving to the final fill process step

Product final fill
Inspection of the downstream product fill process to improve accept and reject rates, leading to improved overall batch yield

Packaging verification
Inspection of label post final fill to ensure that label placement and alignment requirements are fully met from a compliance and quality standpoint



Gowning
Verification that shop-floor gowning SOPs are properly followed by employees to ensure that contaminations are not introduced on the production shop floor

Pathing
Optimizing employee travel throughout the shop floor to minimize time to task

Your idea here
Let's make the computer vision even more impactful by innovating together

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Coca-Cola İçecek (CCI) digital manufacturing

CHALLENGE

CCI is the 6th-largest bottler of Coca-Cola products by sales volume in the world. To clean production equipment they use a "clean in place" (CIP) process, and have a goal to reduce water and energy usage by 12%. However, optimizing the CIP process is currently more art than science and presents the following challenges:

- Lack of visibility to changes in CIP performance
- Difficult to gather insights from millions of data points
- Variability in measurement due to process/human error

SOLUTION

Using AWS IoT and machine learning services, CCI implemented a **Digital Twin** solution, "Twin Sense," in two months, to:

- Provide visibility of leading indicators to CIP performance
- Enable operators and quality team to take actions on process failures
- Identify root cause of problems and garner insights
- Standardize, benchmark, and optimize CIP processes

BENEFITS

Benefits and savings seen over a 6-week period:

- Reduced environmental impact of CIP process
- Saved 1,236 kW of energy
- Saved 560 m^3 of water
- Saved 2,400 L of cleaning agent
- Optimized CIP process time and cost performance
- Improved CIP process visibility for plant operators

CCI is in the process of rolling out the solution to 30 sites

> *"If we can locate failures and other maintenance issues before they happen, we can keep the plant up and running at all times and improve our utilization."*

Suheyla Er Aksoy, Asset Optimization Digital Technology Leader

Headquarters: Istanbul, Turkey

Website:
https://www.cci.com.tr/en

About:
CCI, the sixth-largest bottler in the Coca-Cola system in terms of sales volume. CCI serves 1.2+ billion cases annually to more than 400 million consumers across 10 countries leveraging manufacturing at 26 bottling locations.

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“The world is changed by those out in it.”

Delta Air Lines

So, why are you waiting? Experiment. Invent. Innovate.

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Thank you!

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