

WCO IT/TI  
Conference & Exhibition  
12-14 June 2019  
Baku, Azerbaijan

# Advanced Technologies for adopting a Risk management strategy

Frank Callewaert - *Global Technology Strategist*



# Digital Transformation in Customs and Trade

## *Business Drivers*



# ***Digital Customs Roadmap***    *a phased approach*

Where we come from



Where we want to be



**Intelligent  
globally connected  
eCustoms & eTrade**

- Phase 1: Capture Information Electronically & Process
- Phase 2: Analyze, Declare & Collaborate Information with Customs
- Phase 3: Connect All Stakeholders

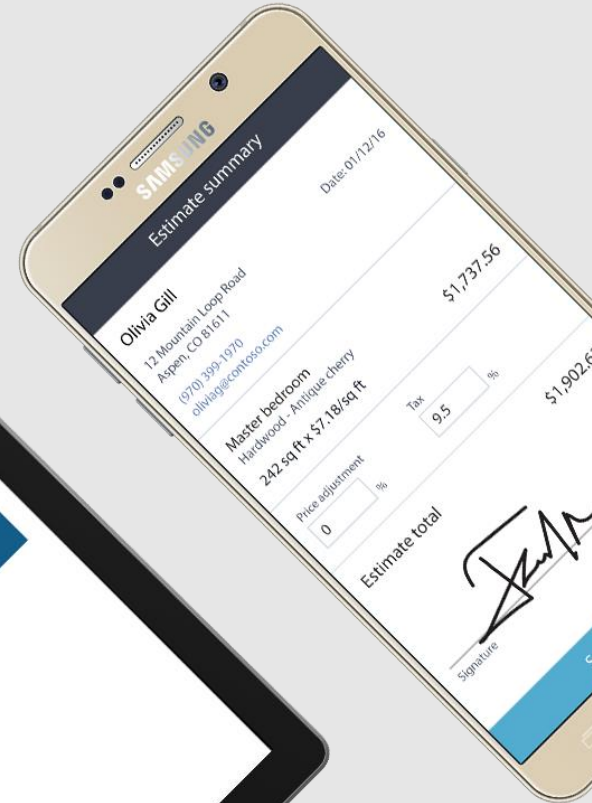
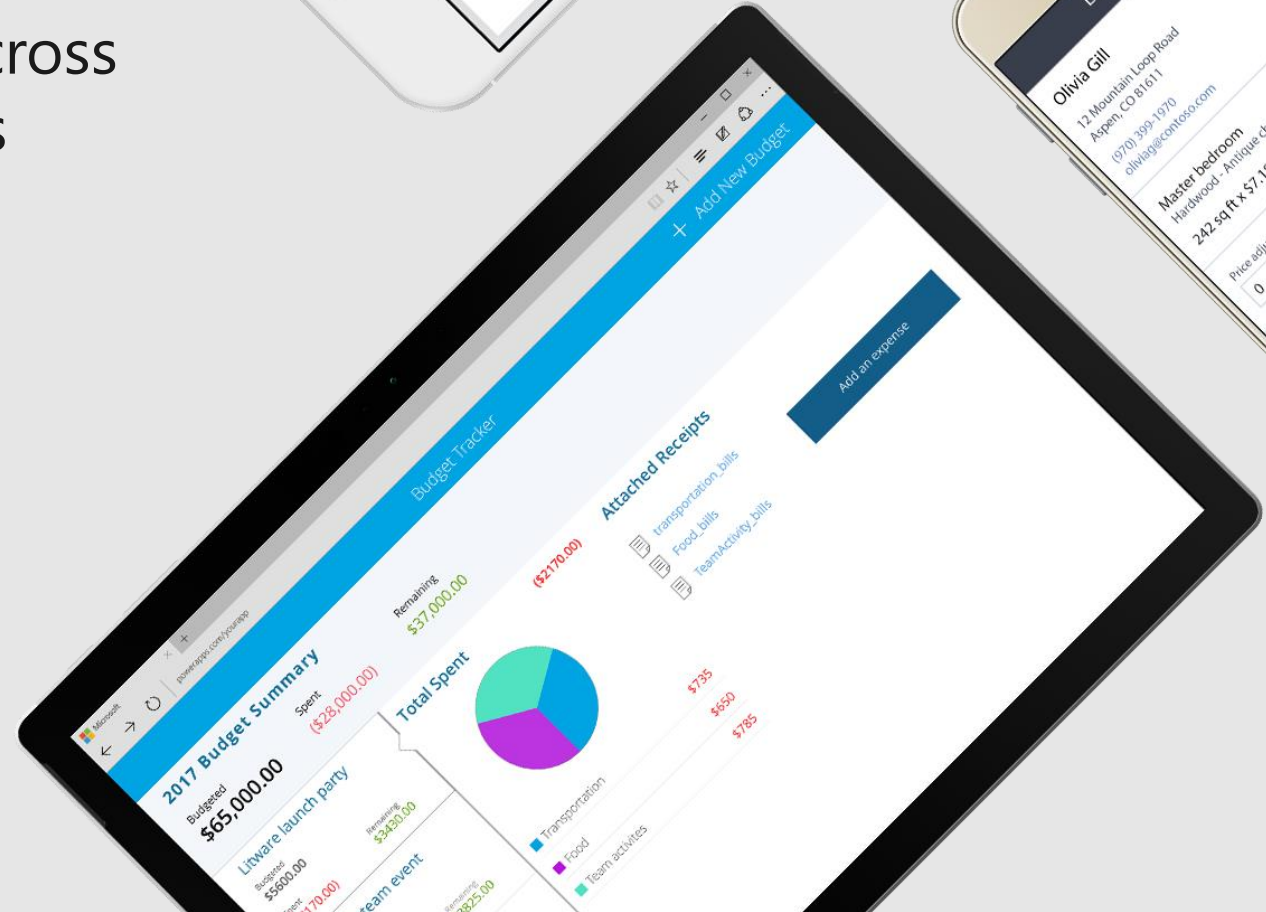
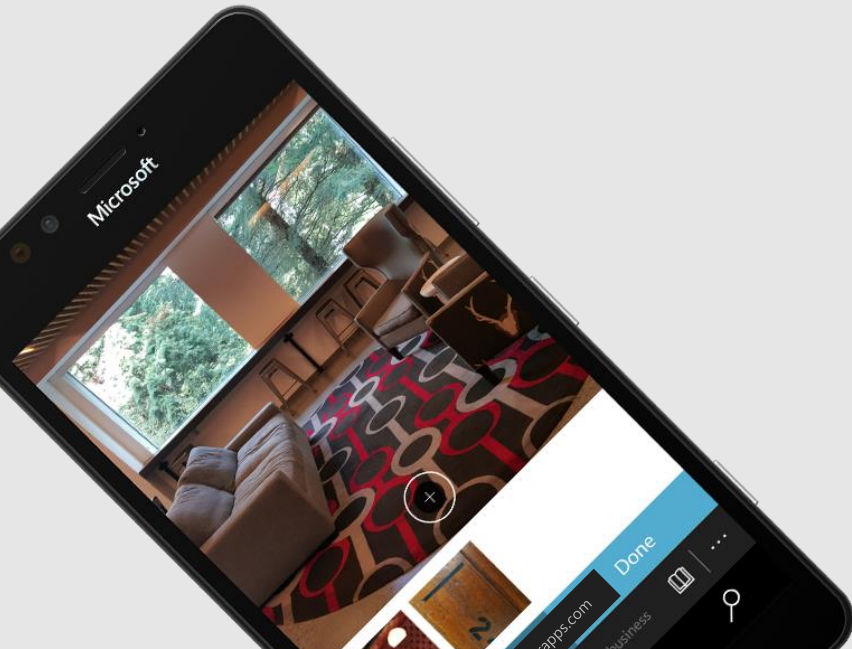
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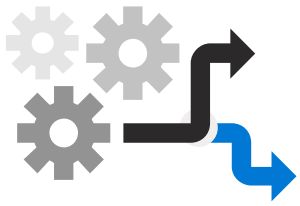
# Capture Information Electronically & Process






# Capture Information Electronically & Process

**PowerApps** Rapidly create mobile and web apps, automate business processes, and innovate faster across eCustoms & eTrade Stakeholders





# Capture Information Electronically & Process

	 <b>Gather</b> Capture and manage files and data	 <b>Automate</b> Streamline repetitive tasks and processes	 <b>Liberate</b> Create custom data insights and interactions
Pro dev	Common Data Service for Apps	Logic Apps	Xamarin and custom BI
Power user	Lists, Microsoft Forms	Microsoft Flow	PowerApps, Power BI

Global community and partner ecosystem



# Knowledge Mining using AI

*Extract, Detect, Relate, Translate, Index, OCR, Handwriting, cryptograms, images, recreate tables from forms, Systematic Literature review, ...*


Documents


Cognitive skills


Fully text-searchable  
rich index





  
Key Phrase extraction


  
Organization entity extraction

  
Face detection


  
Custom skills


  
Location entity extraction


  
Persons entity extraction


  
Celebrity recognition

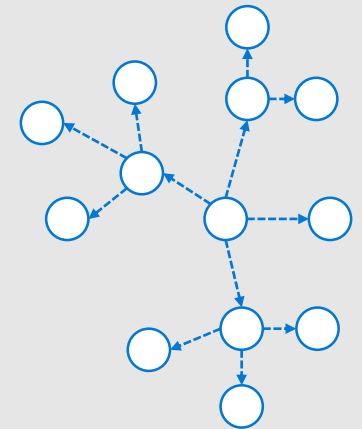
  
Landmark detection

  
Sentiment analysis

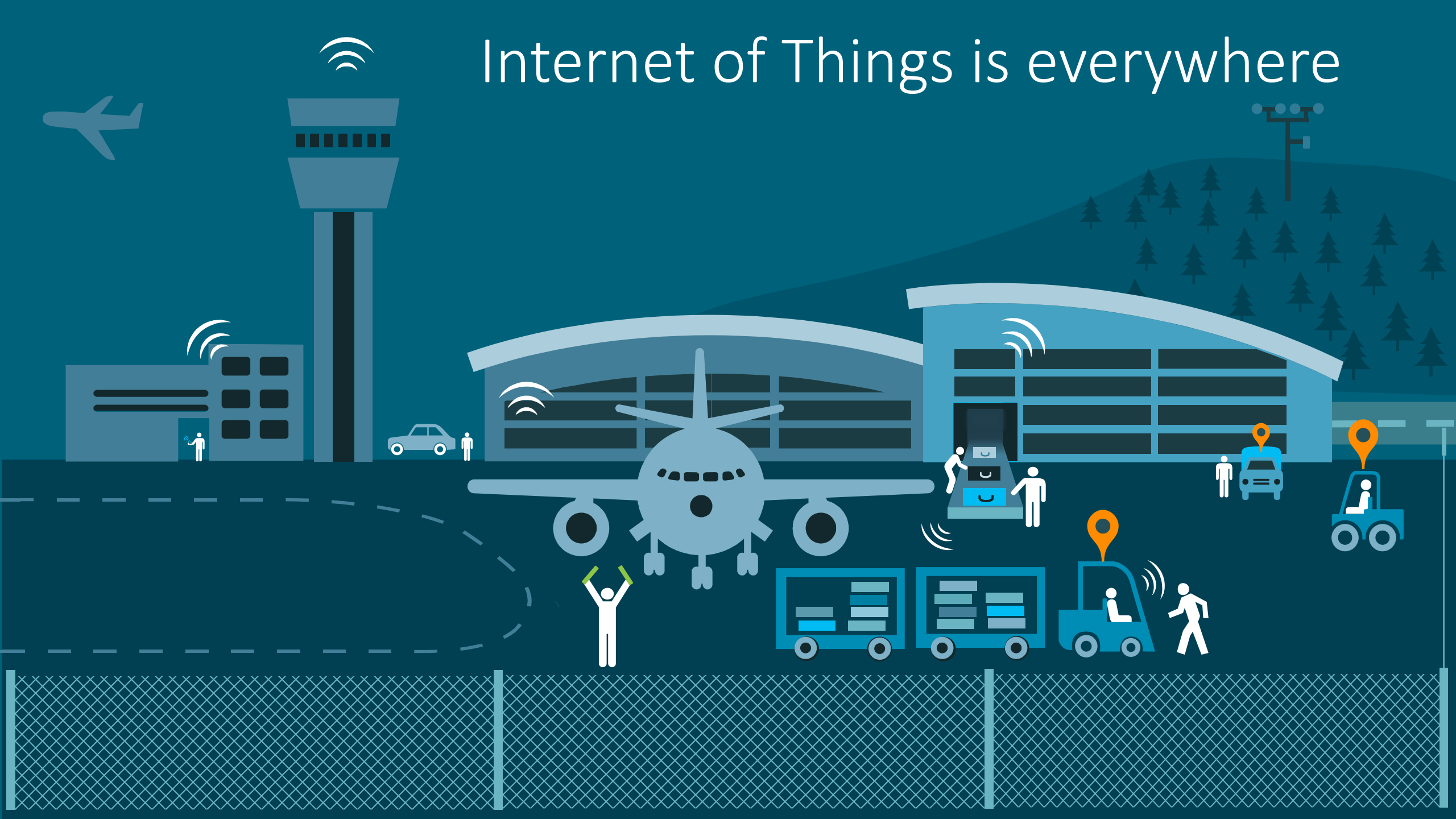
  
Language detection

  
Tag extraction

  
Printed text recognition



# Internet of Things is everywhere



# A Simple View of an IoT Solution

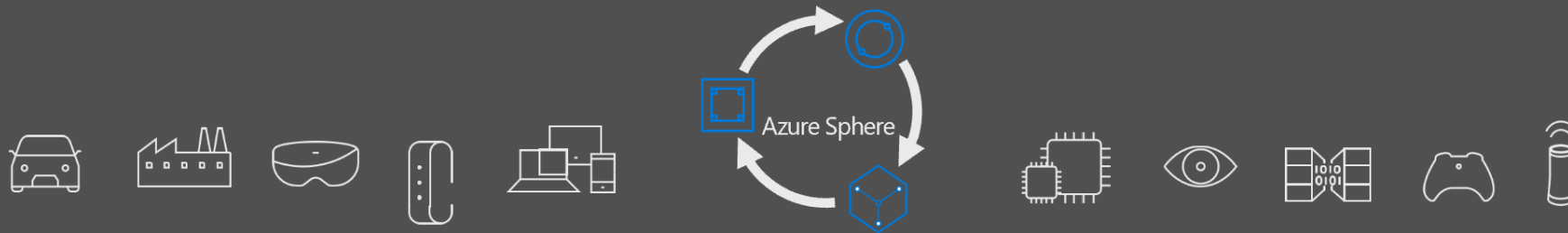




Intelligent Cloud

Intelligent Edge

Azure  
IoT PaaS & SaaS  
IoT solutions and services  
Data & AI Platform



Azure IoT Edge



Freight



Airplanes



Buses

Cargo tracking  
 Fleet monitoring  
 Predictive maintenance  
 Arrival predictions  
 Transport conditions  
 Location Intelligence for Transportation  
 Smart seals  
 Digital Twins



Shipping



Trucks



Trains



Location



Traffic Systems



Engines



Communications



Pets



Livestock



Vaccinations

Livestock & Pets  
 Origin Tracking  
 Health & Vaccines  
 Tracking of  
 timber/lumber



Public Safety



Surveillance



Security



Augmented  
reality



Drones



Equipment



Warehouse



Worker Safety



Wearables

# Internet of Things for eCustoms



Smart Seals



Factories



Multilayer  
QR – RFID

Traceability from producer to Buyer  
 Food Safety  
 Origin Tracking - Quality attestation  
 Counterfeit & Fraud detection  
 Multilayer QR & RFID  
 Smart seals



Agriculture



Port Cranes



Buyer

Identify and monitor threats  
 Site Security and Surveillance  
 Car plate – Container identification  
 People traceability– Site access control  
 Movement Pattern detection  
 MFA and Smart Badging  
 100% Scanning  
 Warehouse Stocking conditions  
 Augmented Reality  
 Digital Twins

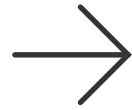


# DATA & AI driven Digital Customs

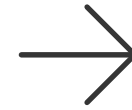
# Microsoft's approach to AI adoption



**Prepare data**



**Build & train**

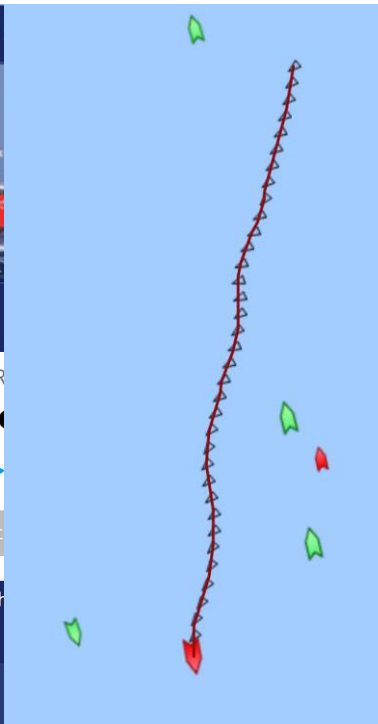
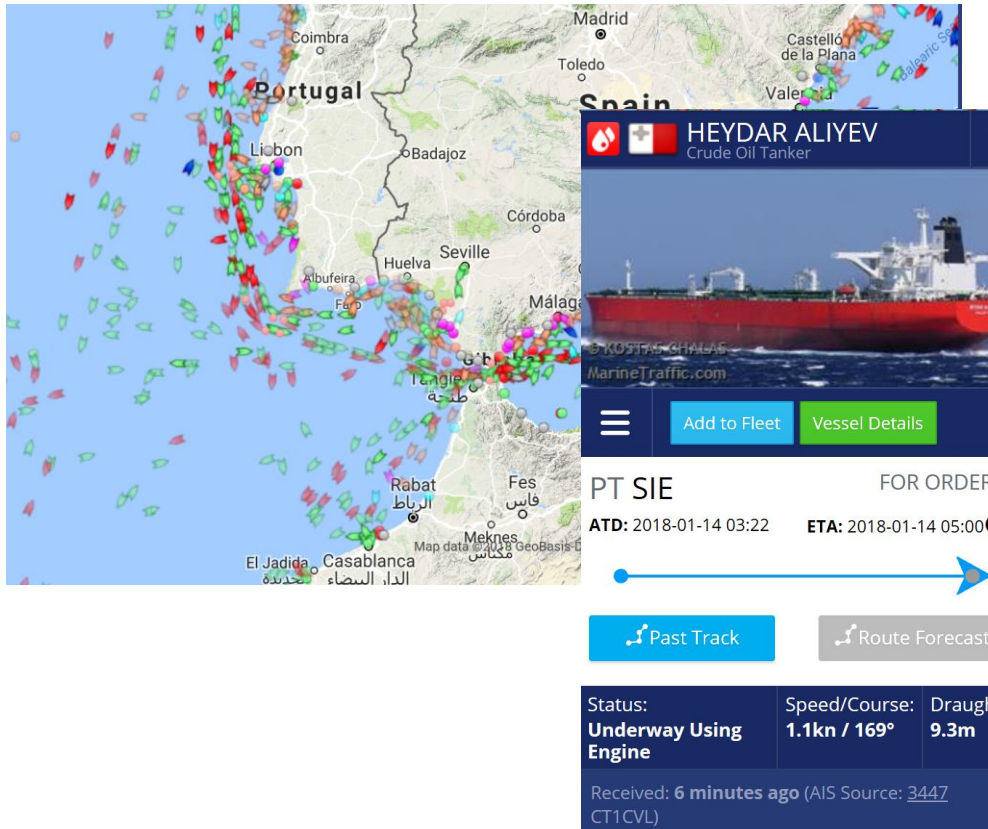


**Deploy**

# Risk Management Framework (RMF) & DATA

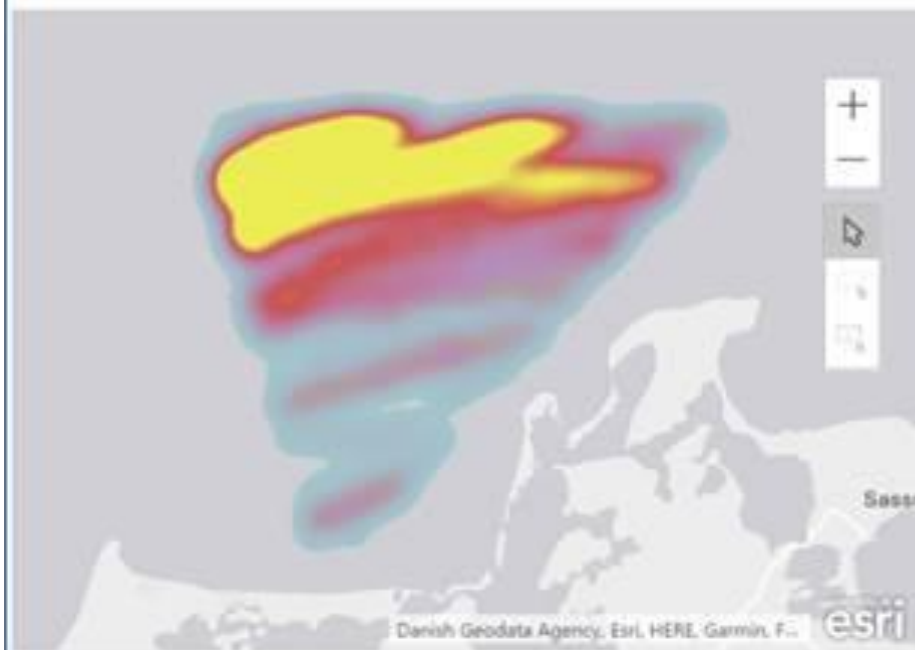
## Gathering Data:

- Open Source data
- Commercial data
- Sectorial data
- Public Sector data



- GPS/IoT Fleet tracking
- Satellite fleet tracking
- Customs Intelligence
- Port Management Systems
- Logistics exchange platforms

Neural Networks & Deep Learning build on data and trained models



timeL - Date

Last

2

Weeks (Calendar)

22/10/2017 - 4/11/2017

timeL - Date

19/10/2017

27/10/2017

mmsi 205465000 205477000 209010000 209014000 209207000 209273000 209355000 209430000 209467000 209662000

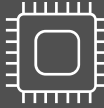


Country name	Count_Rows	distinct mmsi
Netherlands	2,276	69
Antigua and Barbuda	1,701	53
	1,461	47
Cyprus	1,315	43
Liberia	1,231	42
Finland	1,192	26
Germany	969	34
Denmark	669	18
Gibraltar	650	18
Malta	633	23
<b>Total</b>	<b>17,758</b>	<b>552</b>

mmsi	Count_Rows	Country name	Marine Traffic - Ship ID
205465000	24	Belgium	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:205465000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:205465000/</a>
205477000	2	Belgium	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:205477000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:205477000/</a>
205689000	4	Belgium	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:205689000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:205689000/</a>
209010000	31	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209010000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209010000/</a>
209014000	16	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209014000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209014000/</a>
209207000	36	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209207000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209207000/</a>
209273000	37	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209273000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209273000/</a>
209355000	37	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209355000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209355000/</a>
209430000	39	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209430000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209430000/</a>
209467000	19	Cyprus	<a href="https://www.marinetraffic.com/en/ais/details/ships/mmsi:209467000/">https://www.marinetraffic.com/en/ais/details/ships/mmsi:209467000/</a>
<b>Total</b>	<b>17,758</b>		

# DATA & AI driven Digital Customs





# Intelligent action

What happened?   Why did it happen?   What will happen?   What should I do?

# Risk management

Reactive: Example Historical reputation



Store on  
Data Lake or  
Cosmos DB



Query using  
Spark

Requirement: Long term data storage and flexible retrieval

# The Data Lake Approach

Ingest all data  
regardless of  
requirements

Store all data  
in native format  
without schema  
definition

Do analysis  
Using analytic  
engines like Hadoop  
and ADLA



# Azure Data Lake Storage

Hadoop compatible file system interface for Azure Blob Storage

Fine grained file and folder permissions (ACLs)

Atomic file system operations

Full support for all Blob features  
(AAD Integration, Zone Redundant and RA-Geo Redundant Storage)

[Learn more.](#)

Strong  
Partner  
Support

## Azure Data Lake Storage



Scalable, secure storage  
that speeds time to insight

Scale and  
Availability

Speed to  
Insight

Cost  
Effectiveness

Rich Security

 databricks™

  
HORTONWORKS™



  
APACHE  
SPARK™

Optimized for  
performance with  
Spark and Hadoop  
analytics engines



# Azure Cosmos DB

Microsoft's globally-distributed database service

# Introducing Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

SQL



Table API



Key-value



Column-family



Document



Graph

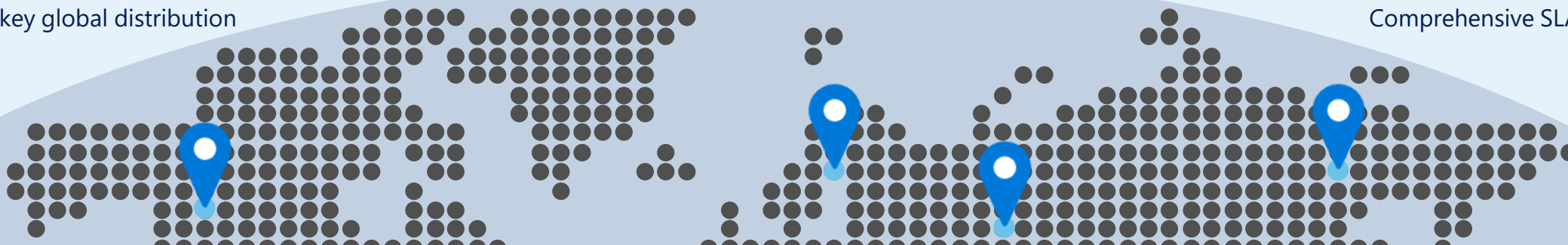
Elastic scale out  
of storage & throughput

Guaranteed low latency at the 99<sup>th</sup> percentile

Five well-defined consistency models

Turnkey global distribution

Comprehensive SLAs



Machine Learning finds patterns in data  
then uses those patterns  
to predict the future

# Risk management: Activity Based Monitoring



Movements  
in area



Meeting

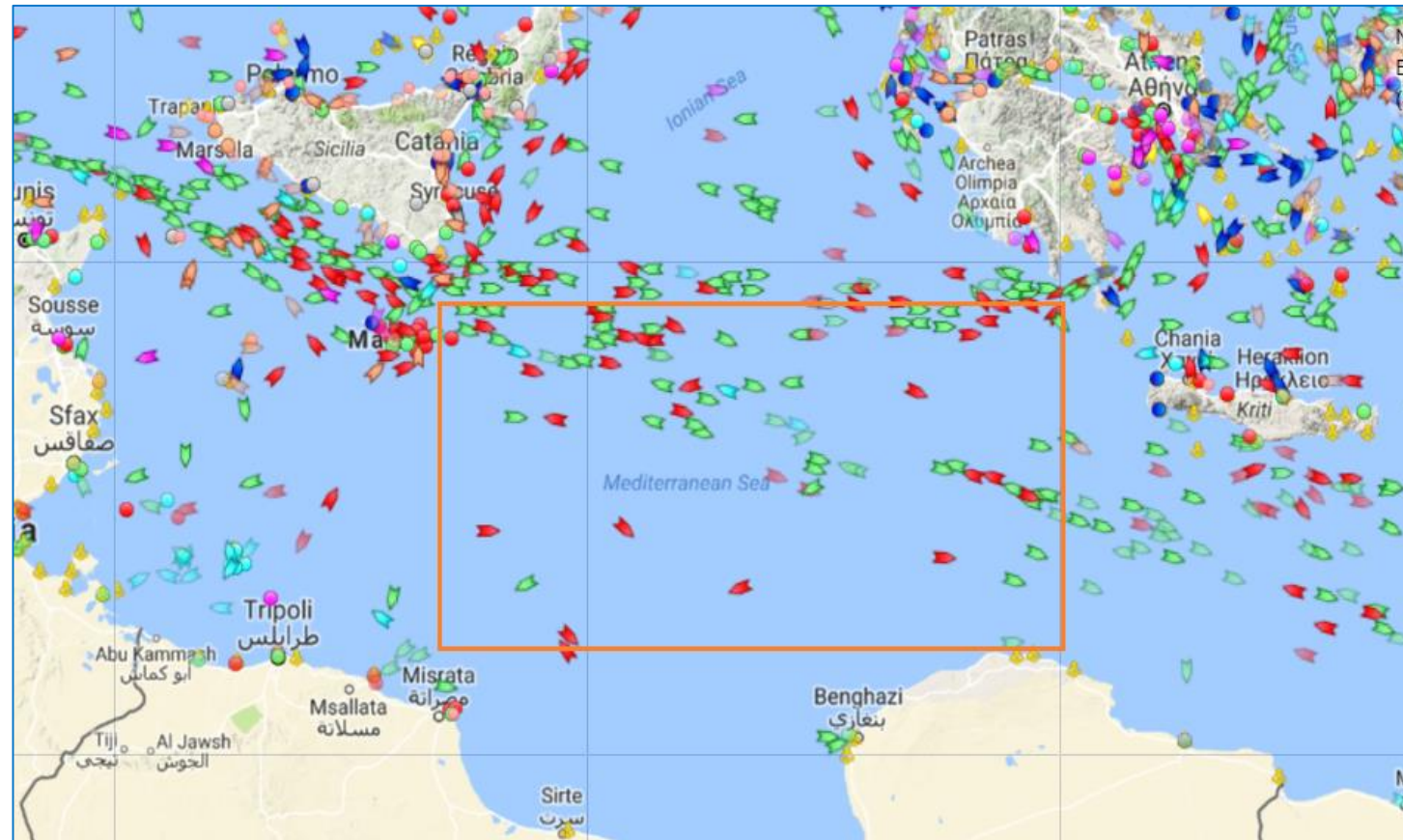


Suspicious  
behaviors

# Use of Machine learning to discover anomalous behaviors in real world transactions or processes

## Dynamic Calculation of Vessel Risk Profile

- Reputation
- Encounter at sea
- Change of speed
- Change of route
- BOL
- Origin of goods
- Tampered or changed container composition



# Risk management: predictive model

Machine Learning: Applied artificial intelligence on realtime data stream



Predict  
Positions



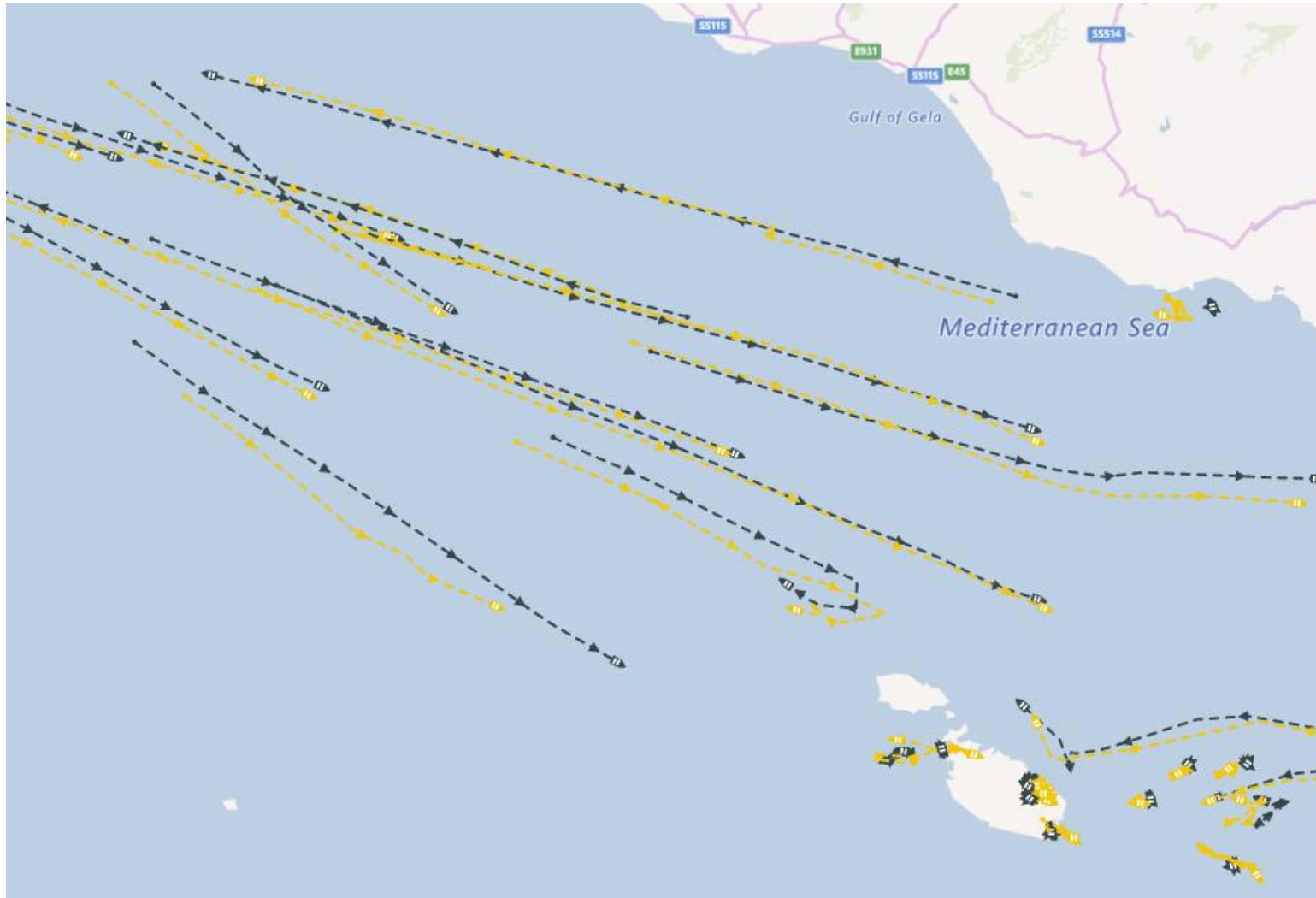
Detect  
Anomalies



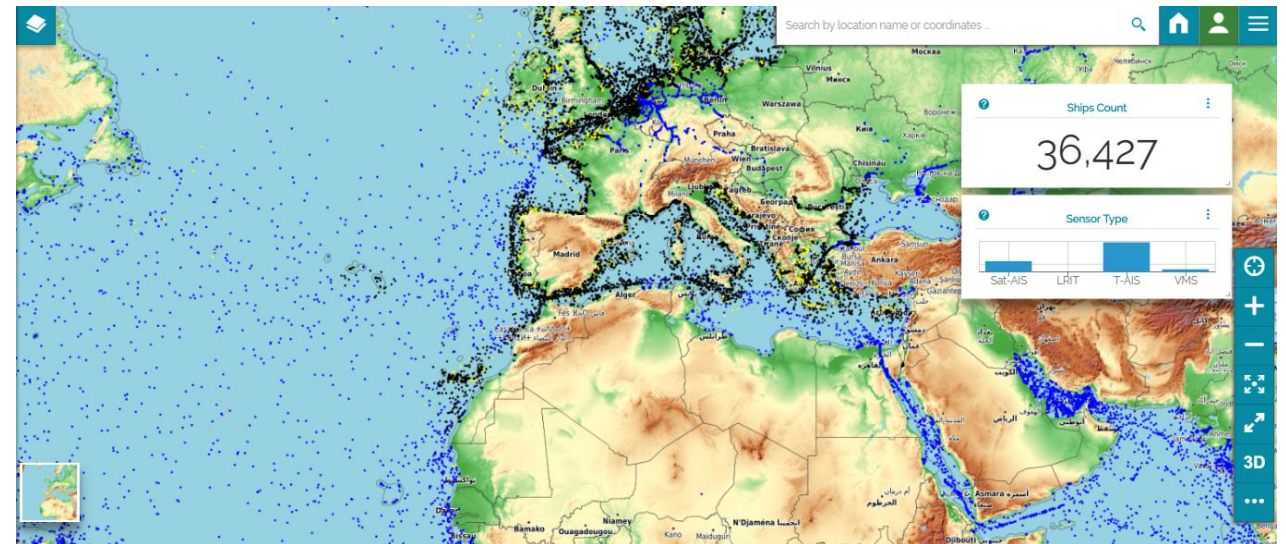
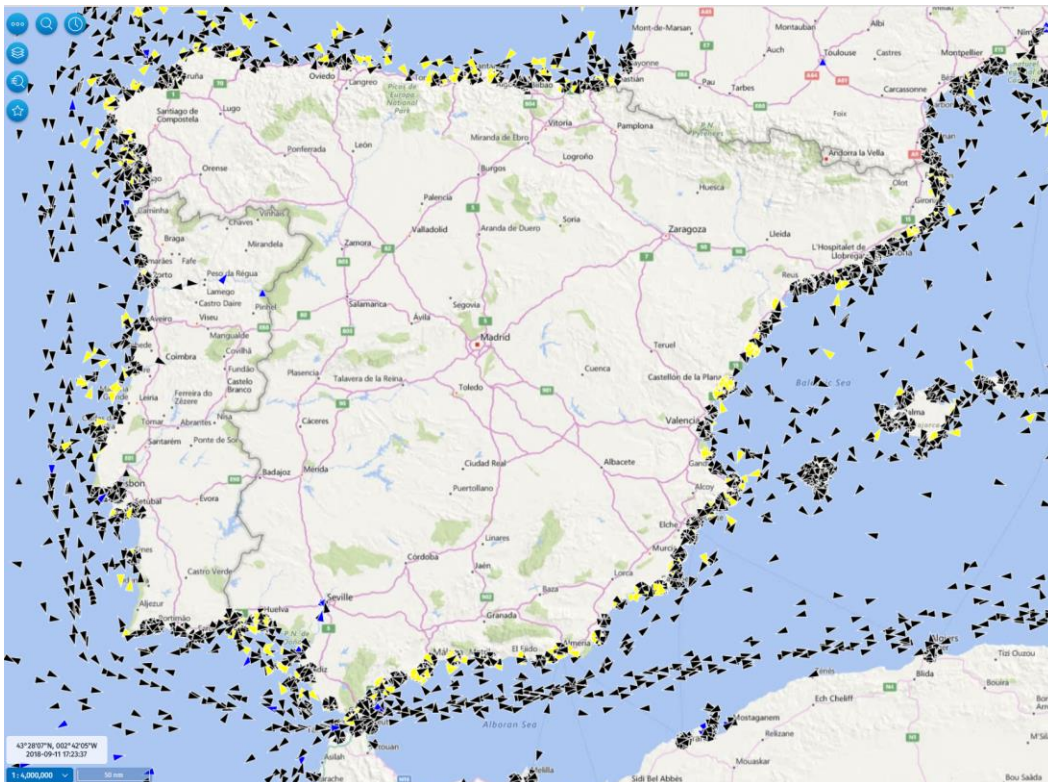
Predict  
Global Risk

# Predict positions within 30 min

**predictive**  
**realtime**



**IMS = Integrated Maritime Services, EMSA's core platform for the EU's 'Integrated Maritime Picture' of ship positions, tracks and behaviours**



→ Four focus area's



R/T  
Maritime  
Picture



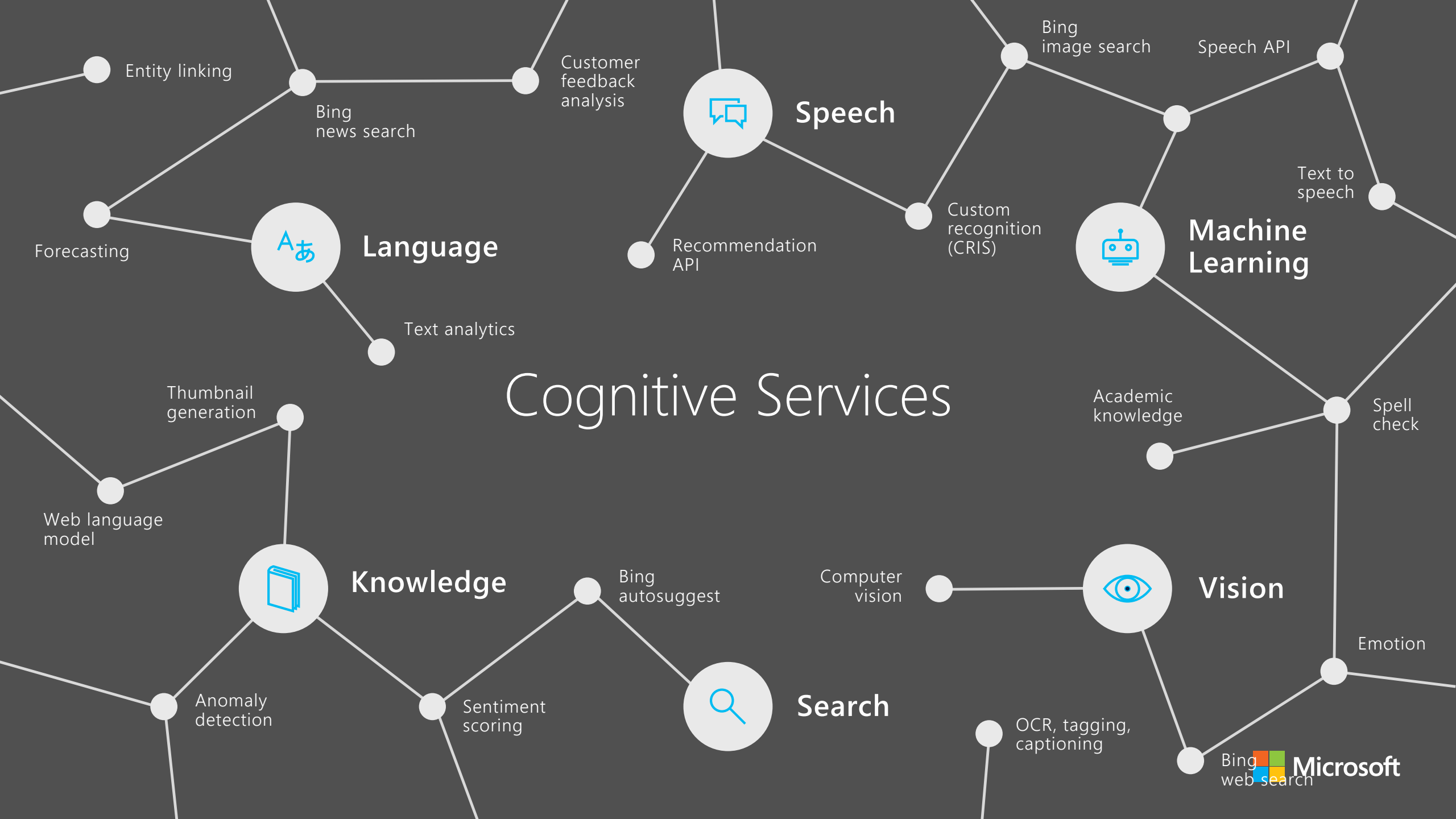
R/T &  
Historic  
ABMs



Long Term  
Storage &  
Queries



Performance,  
Capacity,  
Agility &  
Security



# Technology can perceive the world



# Risk management

## Analyzing imaging-based data



Cognitive  
Services  
Vision



Machine  
Learning

# Analyze image

## Type of image

Clip Art Type	0 Non-clipart
Line Drawing Type	0 Non-Line Drawing
Black & White Image	False

## Content of image

Categories	[{ "name": "Printer" "score": 0.98609375; "Electronics", "score": 0.97609375 }]
Adult Content	False
Adult Score	0.018533889949321747
Description	[{ "description": "a printer sitting on a table Printers" "score": 0.629609375;}]

## Image colors

Dominant Color Background	White
Dominant Color Foreground	White
Dominant Colors:	White, Black
Accent Color	Dark Red



**Tags:**  
printer (98%) electronics (97%)  
indoor (96%) appliance (46%)

**Description:**  
a printer sitting on a table (62%)

**Celebrities:**  
None

**Colors:**  
Dominant background color:   
Dominant foreground color:   
Dominant colors:   
Accent color:

**OCR:**  
 On



# Azure IoT Edge

Vision AI Developer Kit



QUALCOMM

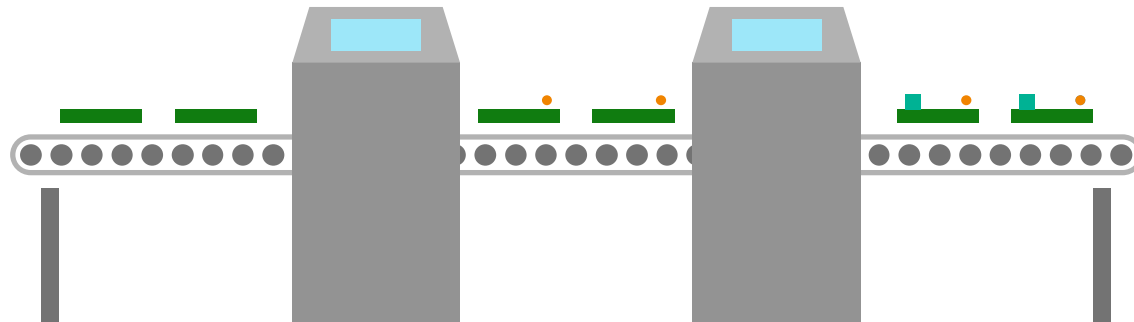
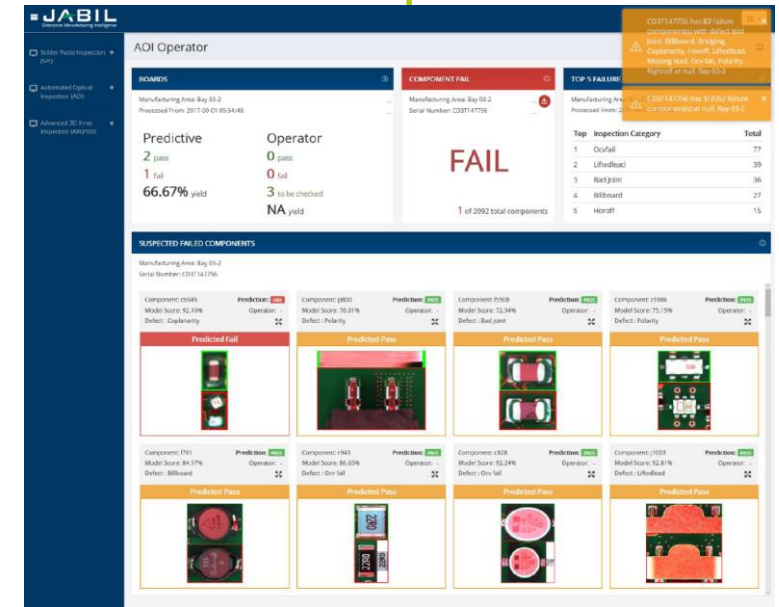
## Visual Recognition Intelligent Service

makes it easy to build a custom image classifier. For example:

- Identify whether a photo includes a picture of your product
- Differentiate between genuine versus counterfeit

<https://visionaidevkit.com/>

# JABIL



RKZ123610-1-2017-02-22 ✓

RKZ323220-1-2017-02-22 ✗

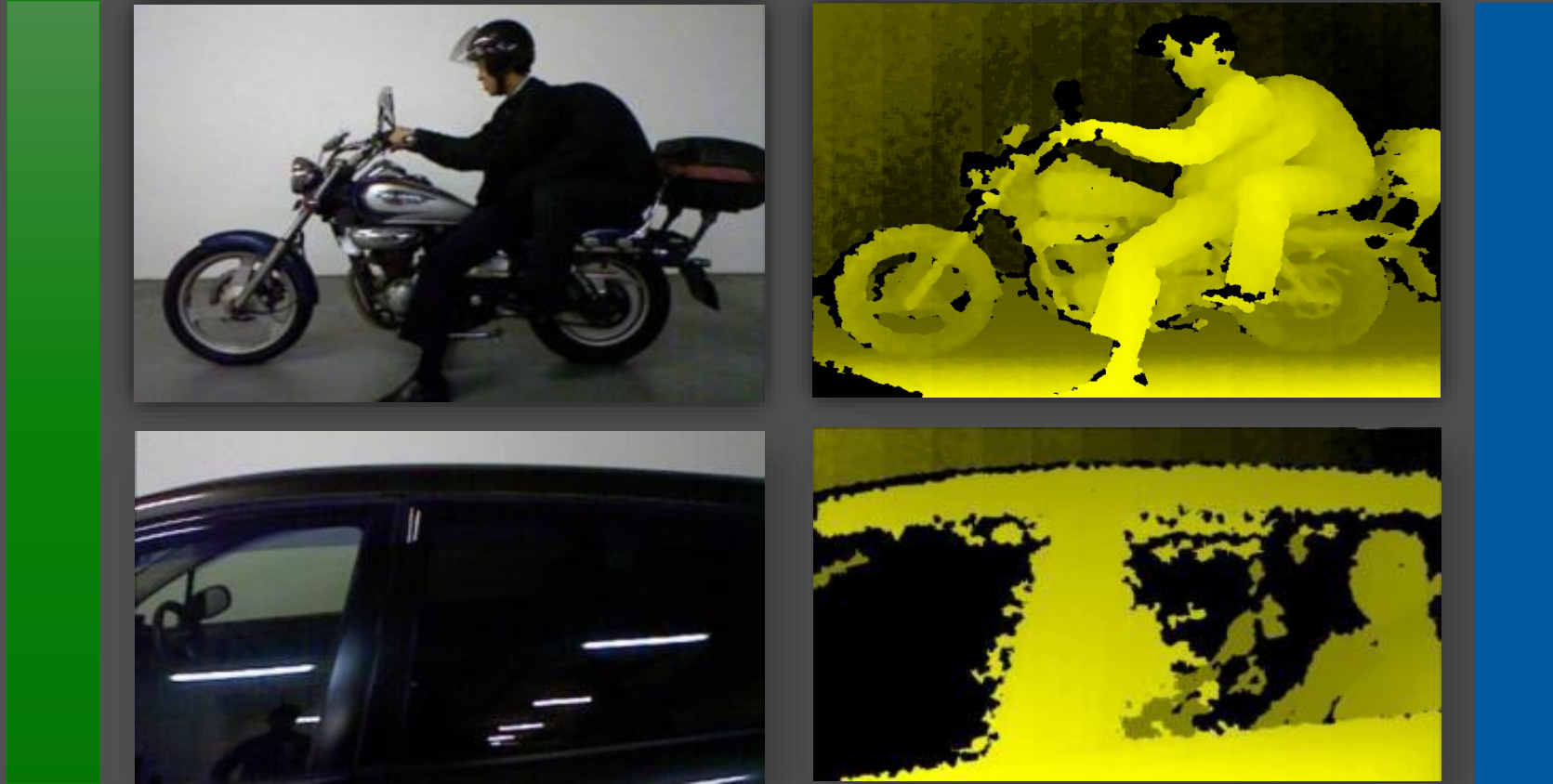
RYN901641-2-2017-04-01 ✓

RKZ123210-1-2017-05-10 ✗

## Optical Image Analysis



# Border Protection with automated Video Surveillance



Microsoft Kinect – the visual recognition system

Vision API – Recognize People and Objects

Video indexer: CCTV detection of people and suspicious behavior

Custom Vision: customize your own state-of-the-art computer vision models for your unique use case





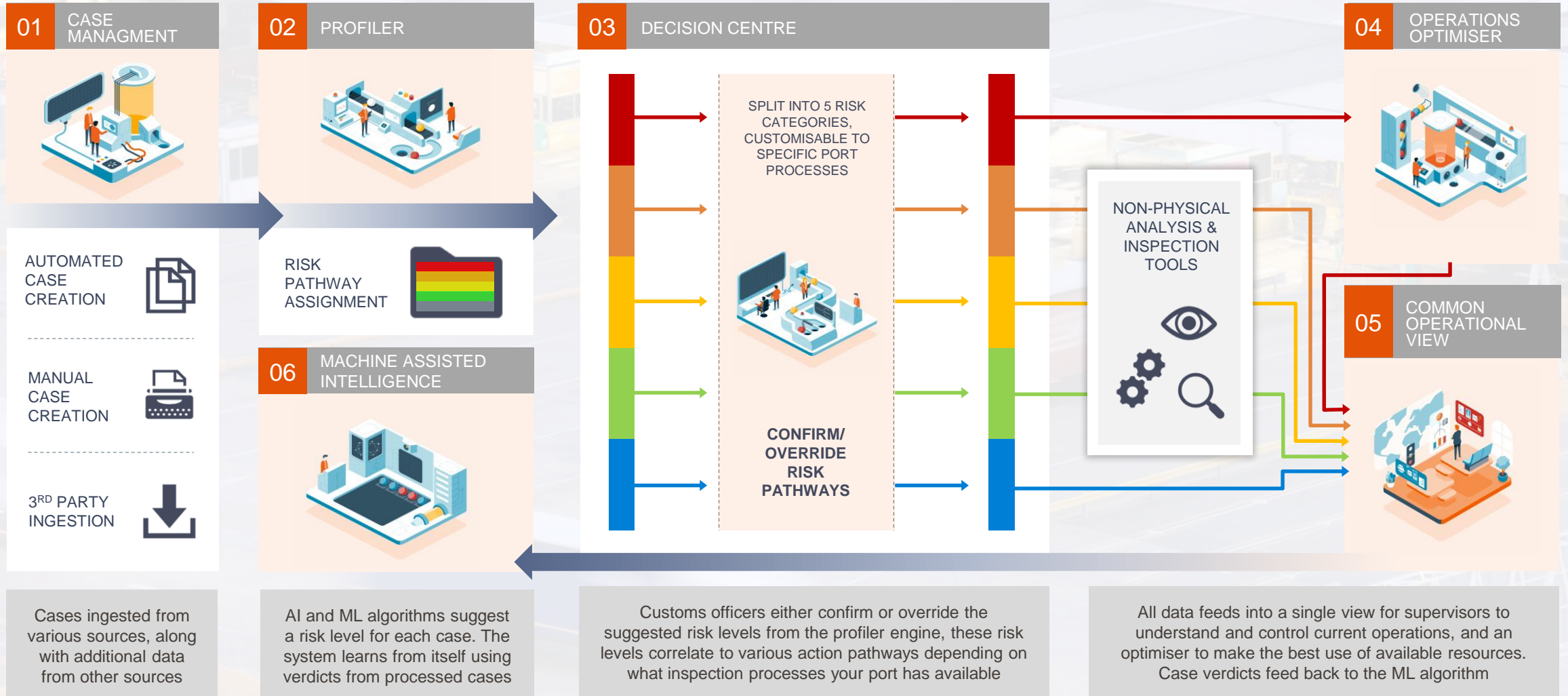
Federal officials in Philadelphia recently seized more than 700 pounds of cocaine hidden in the walls of bedroom furniture and kitchen cabinets



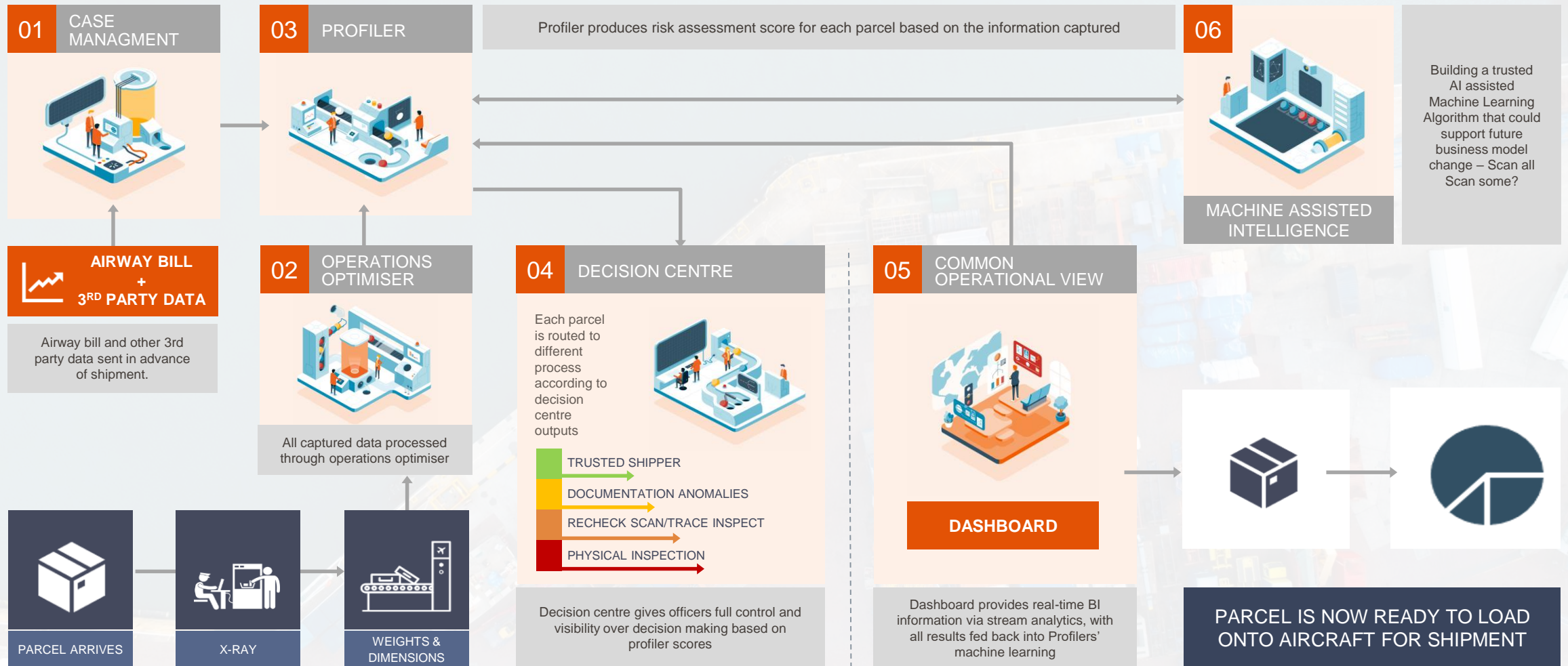
# Discover Explosives & Radiation detections

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# → THE OVERALL PLATFORM – DIGITALLY ACCELERATING YOUR OPERATIONS



## → WHICH CAN ADAPT TO DELIVER NEW AVIATION / AIR CARGO CONOPS



## POWERED BY INDUSTRY-LEADING STANDARDS & TECHNOLOGIES



### BLOCKCHAIN AS-A-SERVICE

CORSYS is a global arbitrator of trust for shipping security; managed by Blockchain distributed ledger



### OPEN PLATFORM

Global open platform linking your own in-house development platforms and competitors apps by our powerful API



### INTEROPERABILITY WITH ANY BRAND OF NII DEVICE

CORSYS is able to support all of your scanners regardless of manufacturer providing interoperability across all your devices



### MACHINE LEARNING ENGINE

Our global data sets have an industry leading perspective on ports and boarders risks and focus areas; enabling a more effective use of your operations teams



### DASHBOARDS FOR ALL DEVICES

Improve processes and get better use from your human capital by providing the most effective single pain of glass to manage operations from the operations centre to the front line



### IOT DEVICE CONNECTIVITY

Connect to any device and data feed to aggregate information into one platform



### AUGMENTED INTELLIGENCE

Leverages the power of a strong mixed reality approach, with a mission focus on the convergence of multiple data sets fused together, combined with the results of physical inspection approach.



### CLOUD FIRST DESIGN

The CORSYS service is built using industry leading security controls; with centrally managed policies and controls; partnering with leading vendors such as Microsoft



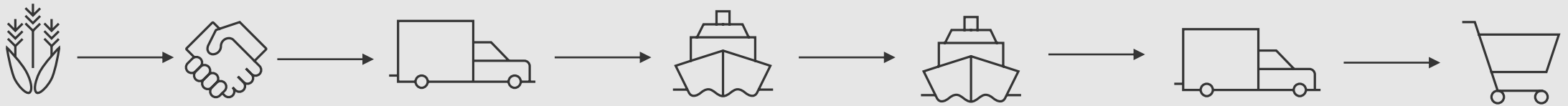
# Blockchain

# Blockchain for Supply Chain & eCustoms Scenarios

Farm to Buyer

Trade (Import/Export)

Retail to Consumer

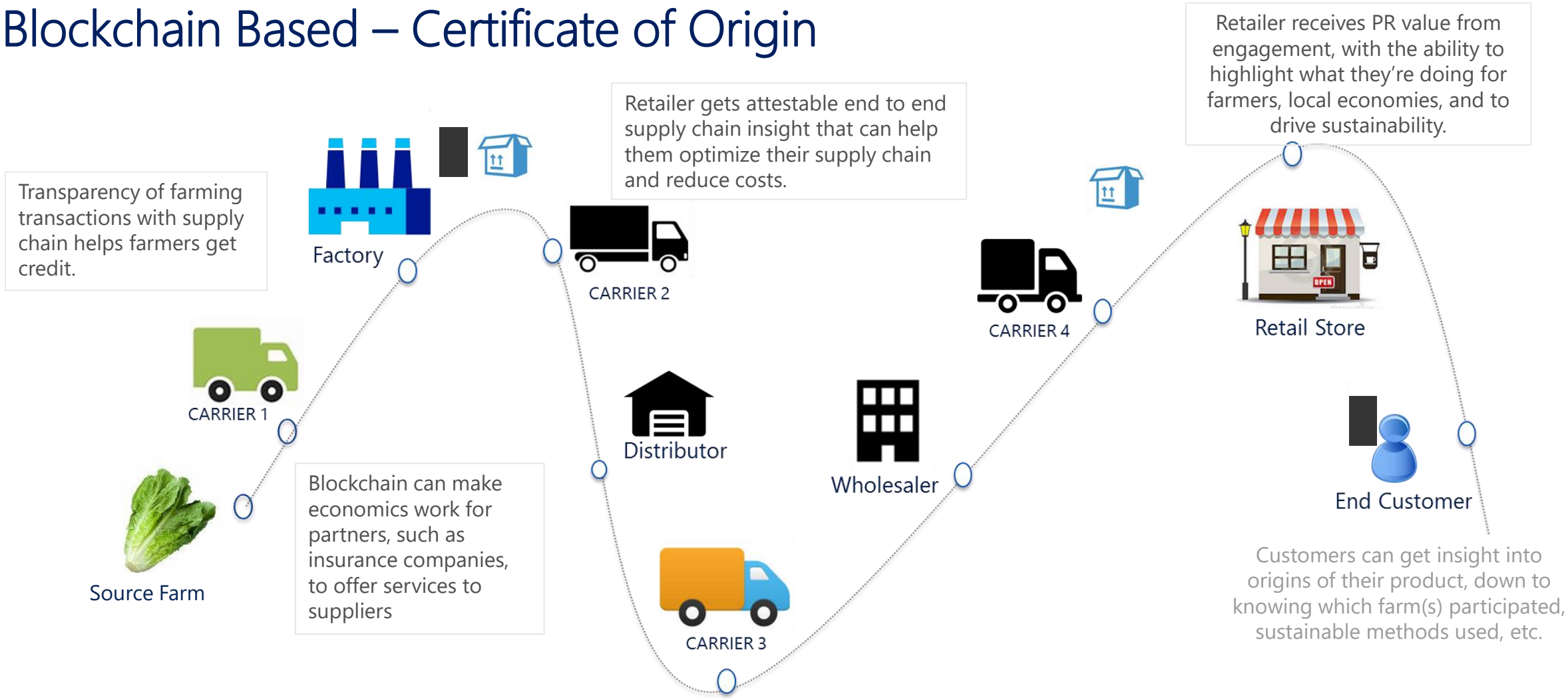


**Provenance – Certificate of Origin**

**Environment Monitoring w/ IoT (Temperature and Humidity)**

**Dispute Resolution**

# Blockchain Based – Certificate of Origin

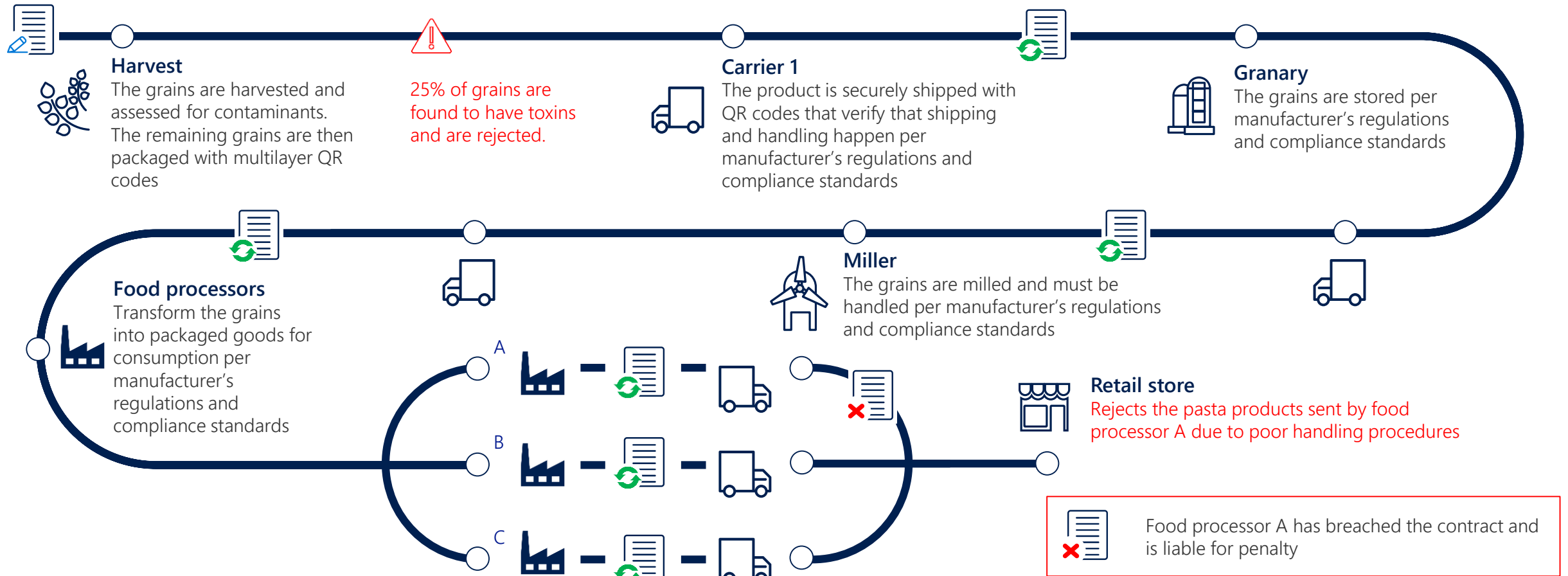


— Farm to Factory — Factory to Distributor — Distributor to Wholesaler — Wholesaler to Retail — Retail to Consumer










Customs has insight into the entire process

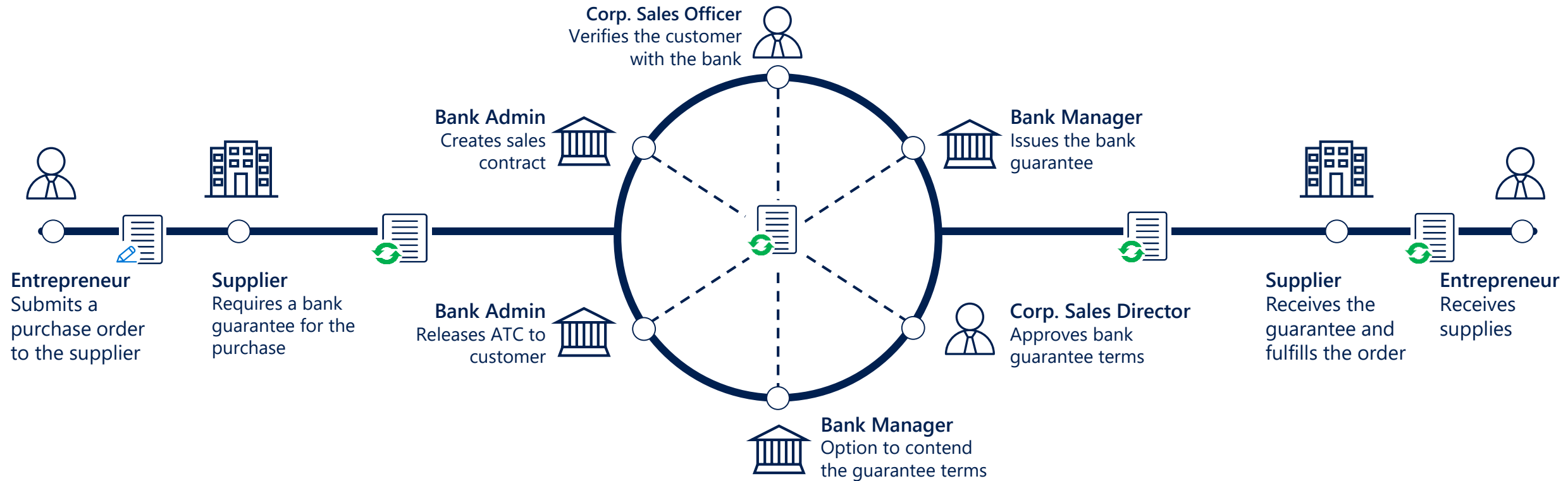
# Blockchain in action | Real-time grain tracking



## SHARED LEDGER

 <b>Smart contract created</b> Grain needs to be harvested and shipped.	 <b>Harvest</b> <ul style="list-style-type: none"><li>25% of grains have toxins</li><li>75% of grains are shipped</li></ul>	 <b>Carriers</b> <ul style="list-style-type: none"><li>Grains delivered</li><li>Compliant handling</li></ul>	 <b>Granary</b> <ul style="list-style-type: none"><li>Grains stored</li><li>Compliant handling</li></ul>	 <b>Miller</b> <ul style="list-style-type: none"><li>Grains milled</li><li>Compliant handling</li></ul>	 <b>Food processors</b> A: Pasta products B: Bread products C: Rice products	 <b>Retail store</b> A: Rejected – non-compliant handling B: Accepted C: Accepted
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# Interswitch | Seamless supply chain financing



## SHARED LEDGER



### Smart contract created

- Entrepreneur submits a purchase order to a supplier



### Contract updated

- Supplier requests a bank guarantee



### Contract updated

- Bank and the supplier agree on guarantee terms



### Contract updated

- The supplier receives the guarantee and fulfills the purchase

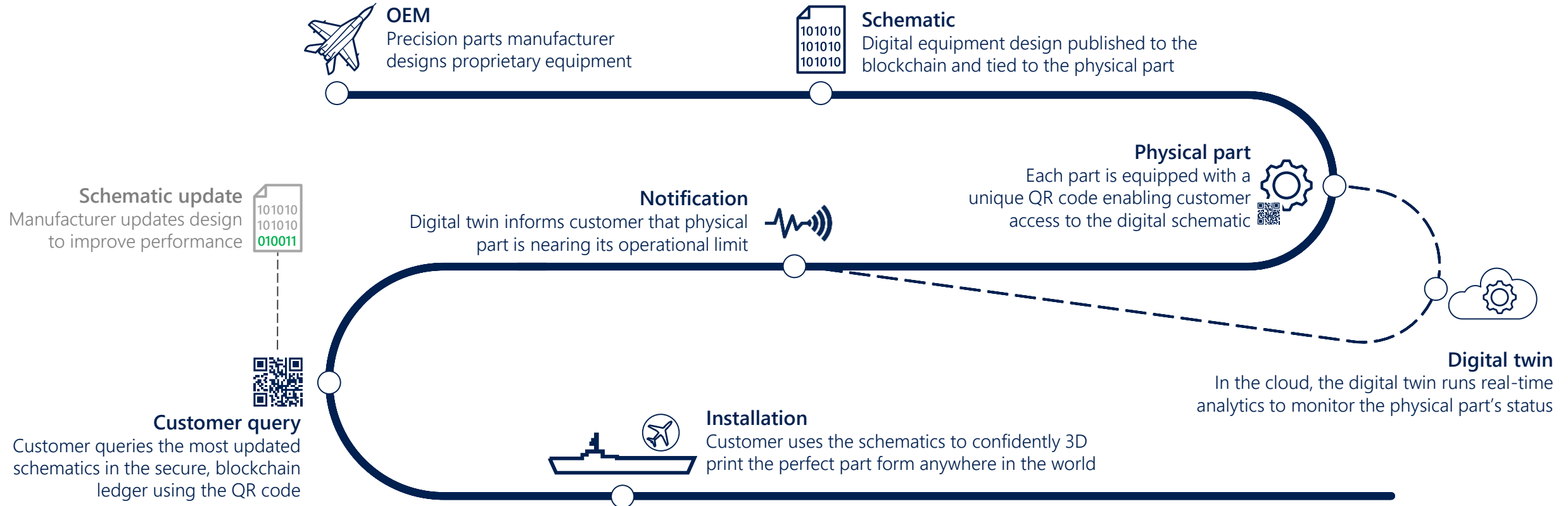


### Contract updated

- Entrepreneur receives the supplies

# 3D printed assets tracking

MOOG



## SHARED LEDGER



### Digital schematic

- Part #1560-01-505-8009
- Material: Titanium
- 3.12mm x 4.33mm



### Unique QR code

- Part #1560-01-505-8009
- Product ID #12.645.23
- Digital Twin ID #12.645.23
- Unique QR code link



### Manufacturer updates

- Part #1560-01-505-8010
- Material: Titanium
- 3.13mm x 4.34mm



### Critical replacement

- Part #1560-01-505-8010
- Product ID #12.645.24
- Material: Titanium
- 3.13mm x 4.34mm

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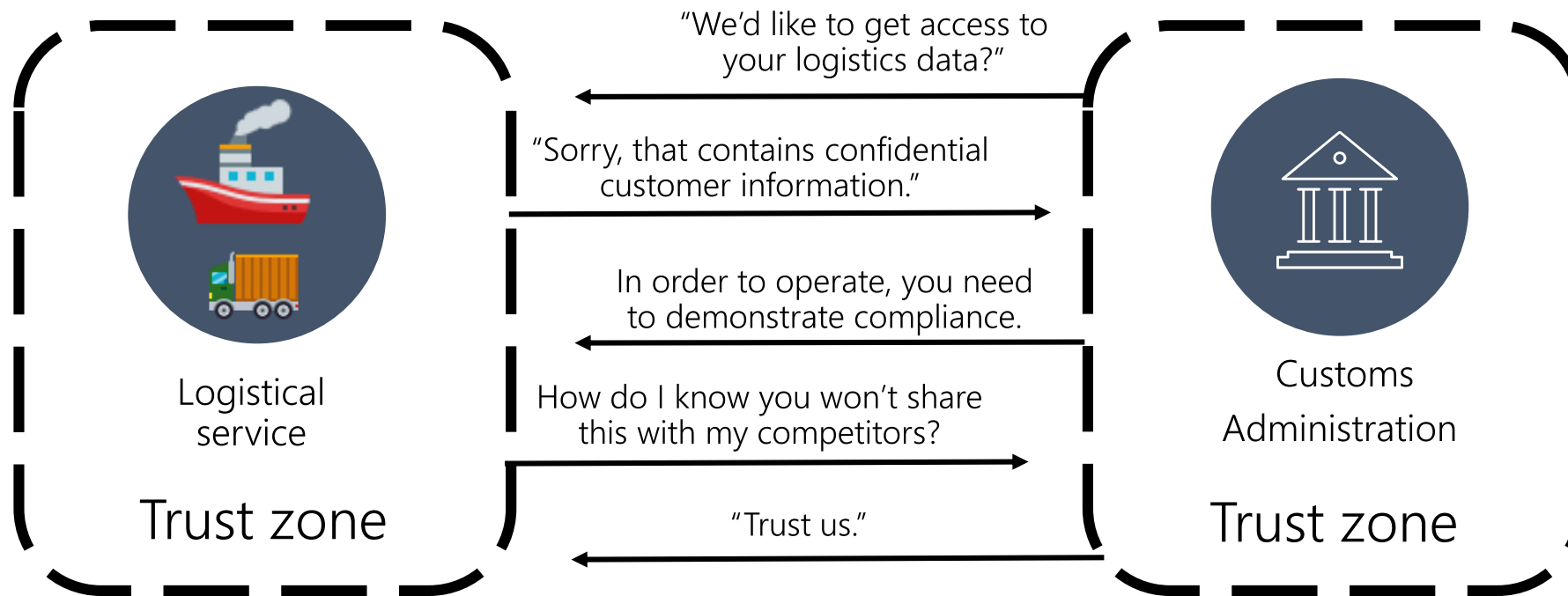


# Connecting all Stakeholders

## *Data Sharing*

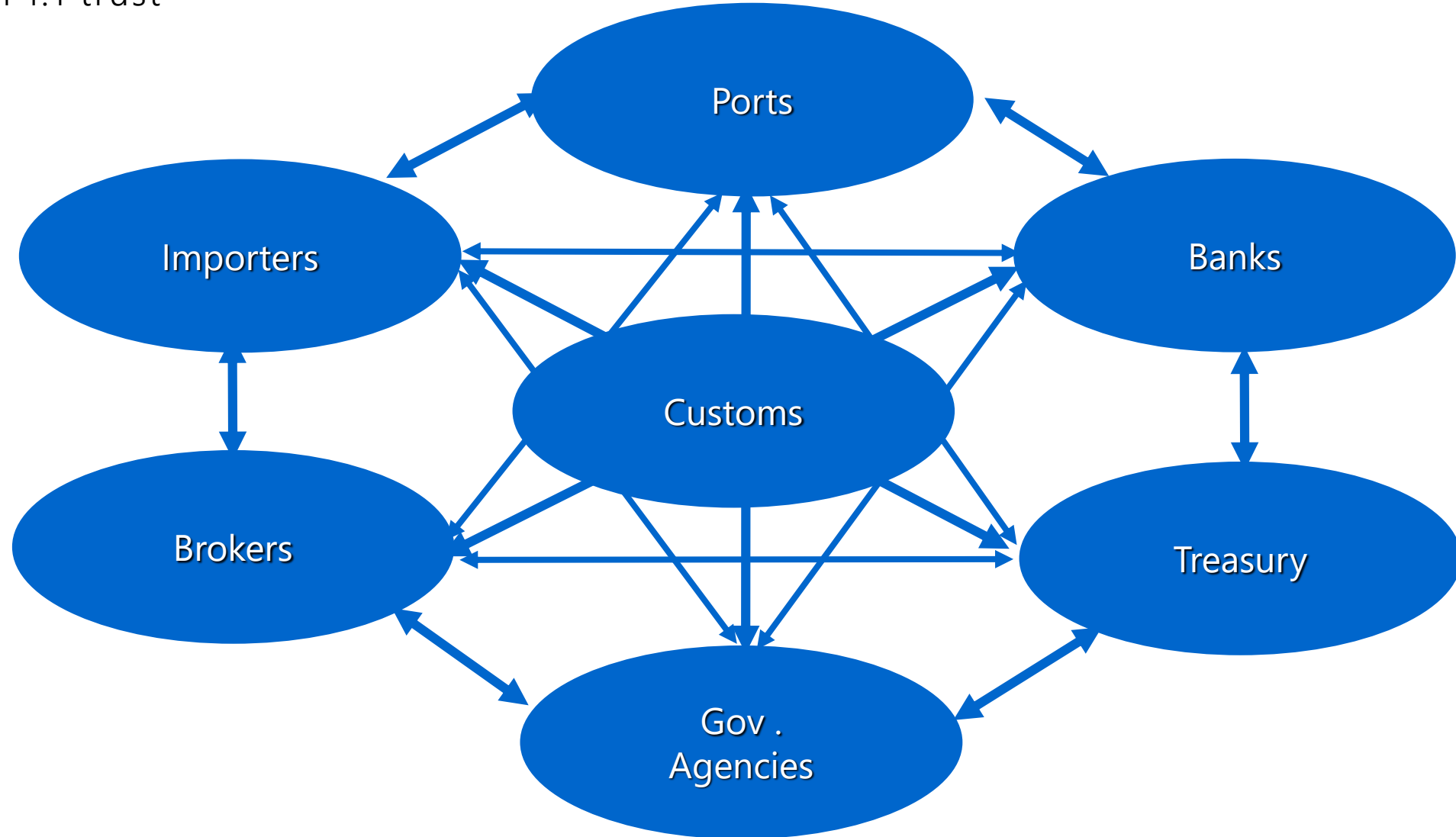
# DATA SHARING IS CHALLENGING

A LACK OF TRUST BETWEEN DATA PROVIDERS AND DATA CONSUMERS



# DATA SHARING IS CHALLENGING

Full mesh 1:1 trust



# Single Window Definitions

- UN/CEFACT:

Single Window can be described as "a system that allows traders to lodge information with a single body to fulfil all import or export-related regulatory requirements"

- WCO:

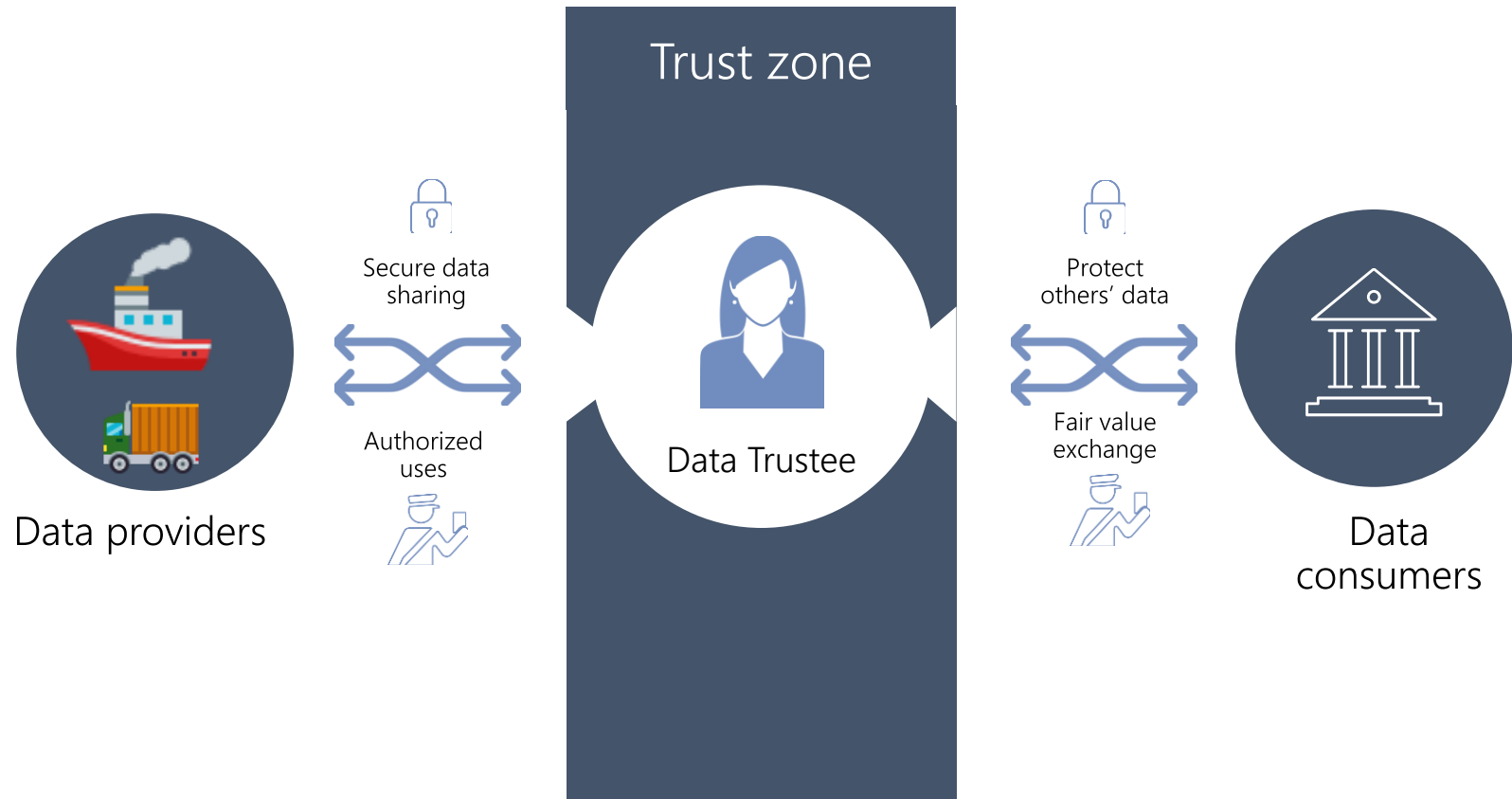
„A facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit related (...) regulatory requirements”.

- EU Customs Code:

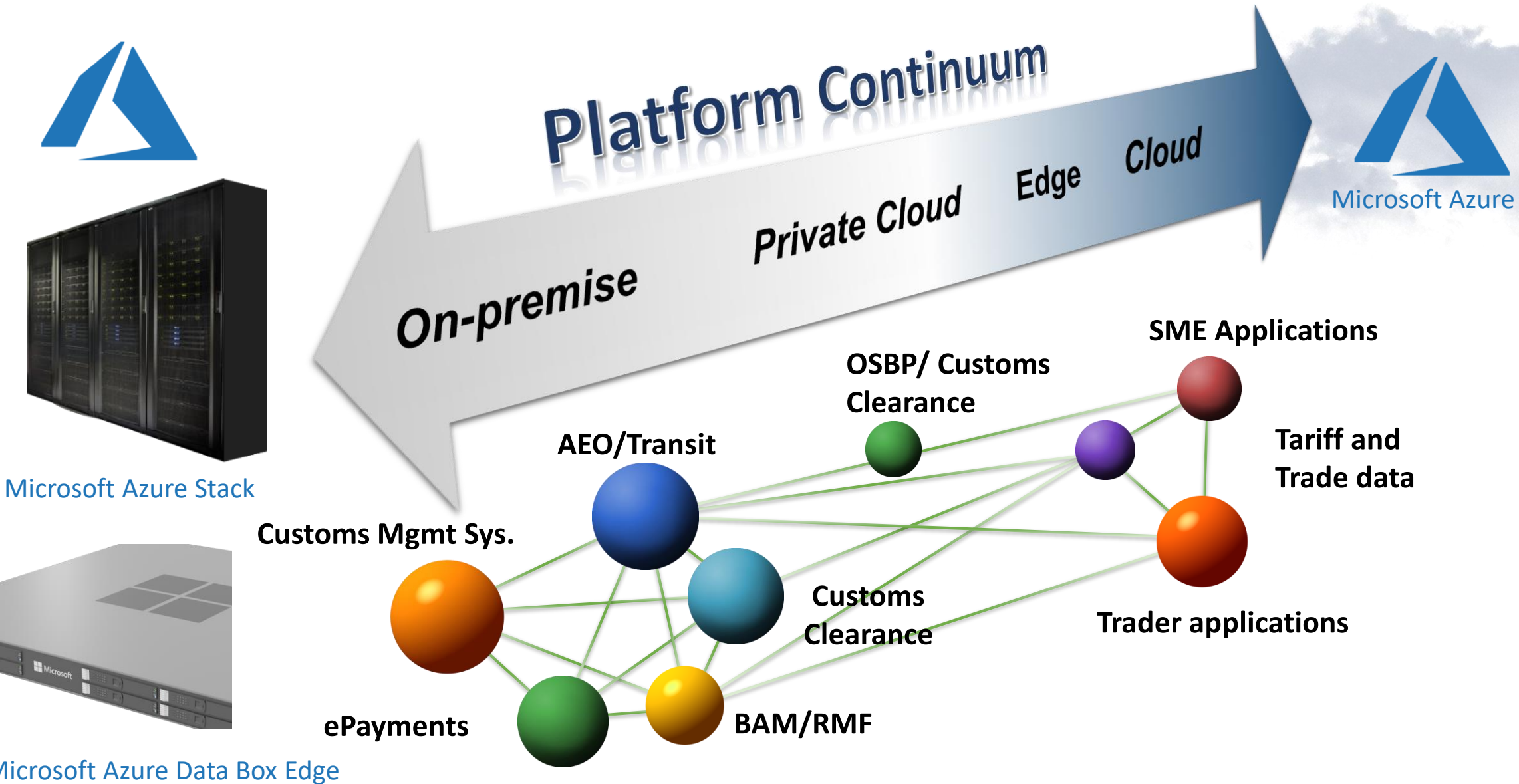
„It is appropriate that the information provided by economic operators is shared, taking account of the involved in that control, such as police, border guards, veterinary and environmental authorities, so that the economic operator need give the information only once ('single window')”.

# DATA SHARING IS CHALLENGING

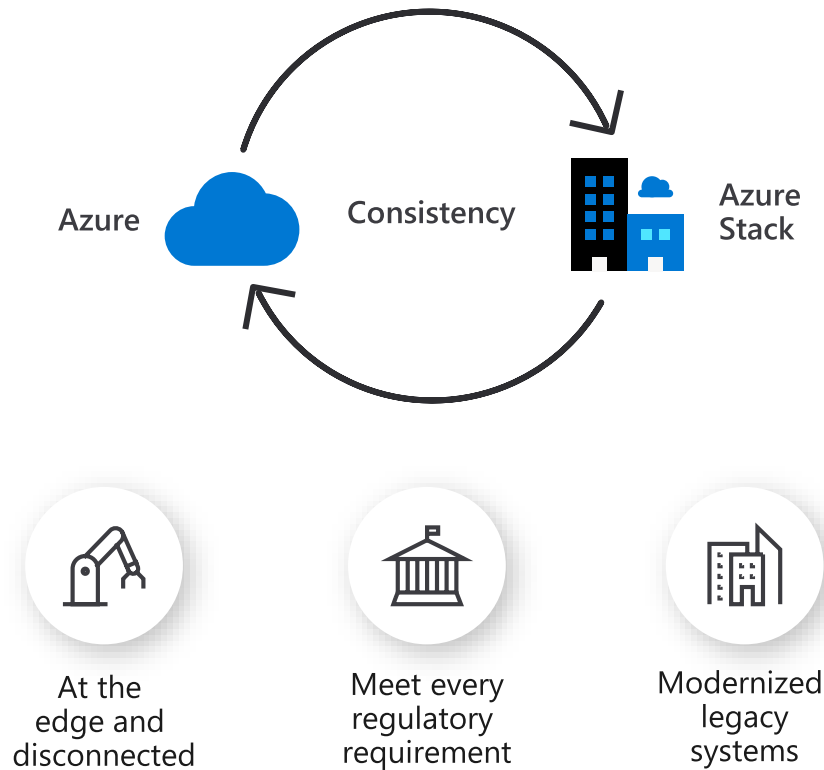
WHAT IF WE COULD CREATE A NEW ZONE OF TRUST?



# Choose Your Application Strategy ...



# Azure Stack

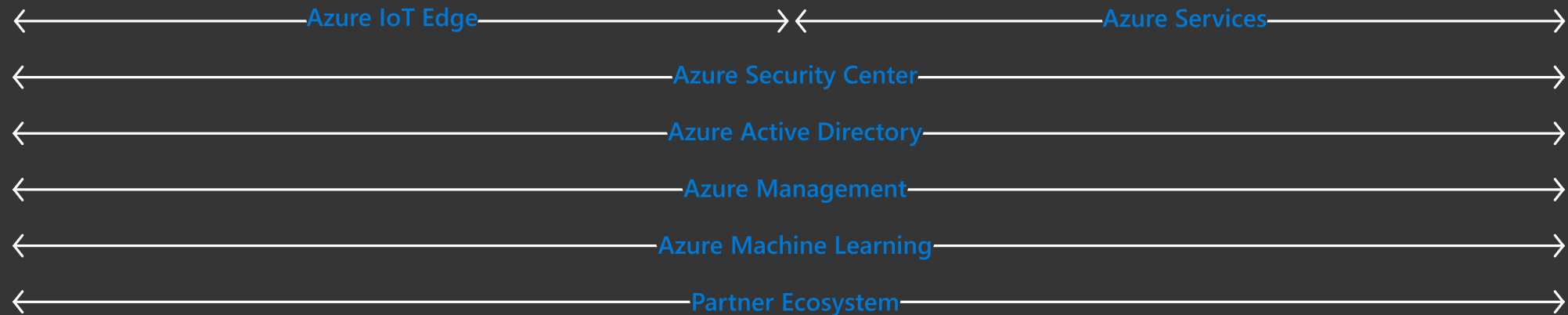


## Azure Stack updates

Kubernetes on Azure Stack  
Expanded capacity for Azure Stack  
Azure event hubs on Azure Stack  
Consistent Blockchain deployment



# Consistency across the cloud and the edge



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# Technology empowers Customs *to drive more complex initiatives*



Cloud based  
applications



Analytics - Big Data  
Machine Learning  
Blockchain



Internet of  
Things



Augmented  
Virtual Reality



Digitize labor intensive, paper-based processes

Enable cross-agency collaboration

Address expanding volume and cost of data

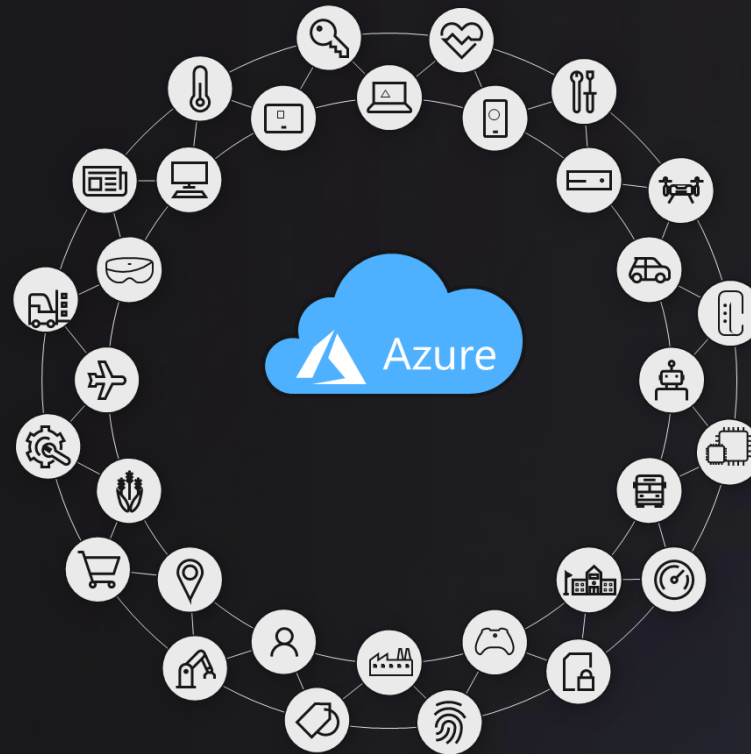
Optimize budget

Upgrade aging, costly and inflexible legacy  
technology

Achieve security, privacy and regulatory  
compliance

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ໂພນຄູນຄວັບ    Obrigado    شكریه    Terima Kasih    Dziękuję

Hvala    Köszönöm    Tak    Dank u Wel    ДЯКУЮ    Tack

Mulțumesc    спасибо    Danke    Cám ơn    Gracias

多謝晒    Ďakujem    תודה    நன்றி    Děkuji    감사합니다