



IoT Analytics and ML from Cloud to Edge and back



Neeraj Kumar – Enterprise Solutions Architect at AWS

Jan Metzner – Specialist Solutions Architect for IoT, EMEA at AWS

Jens Greiner – Global Manager IoT Development at SKF

What will you learn in this session?

- We will go Deep - so be warned!
- IoT on the edge and in the cloud
- Analytics and ML

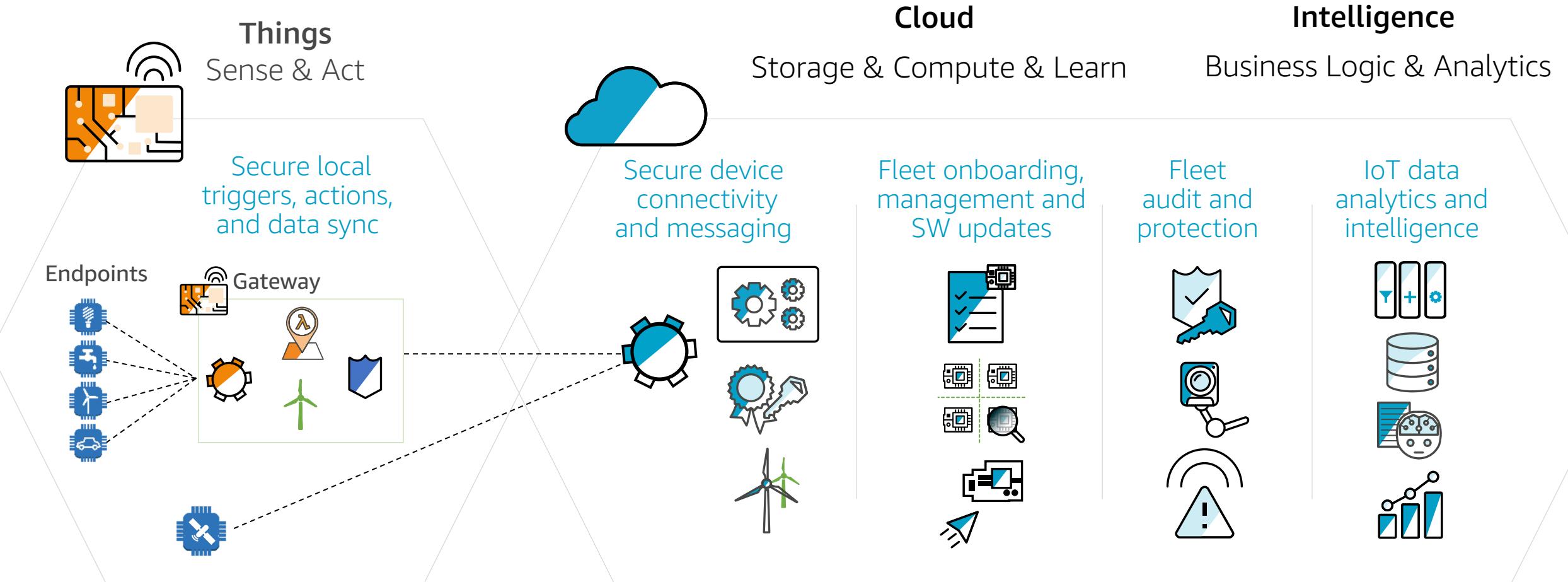
If you knew the **state of every thing** and
could **reason on top of that data...**

what problems would you solve?

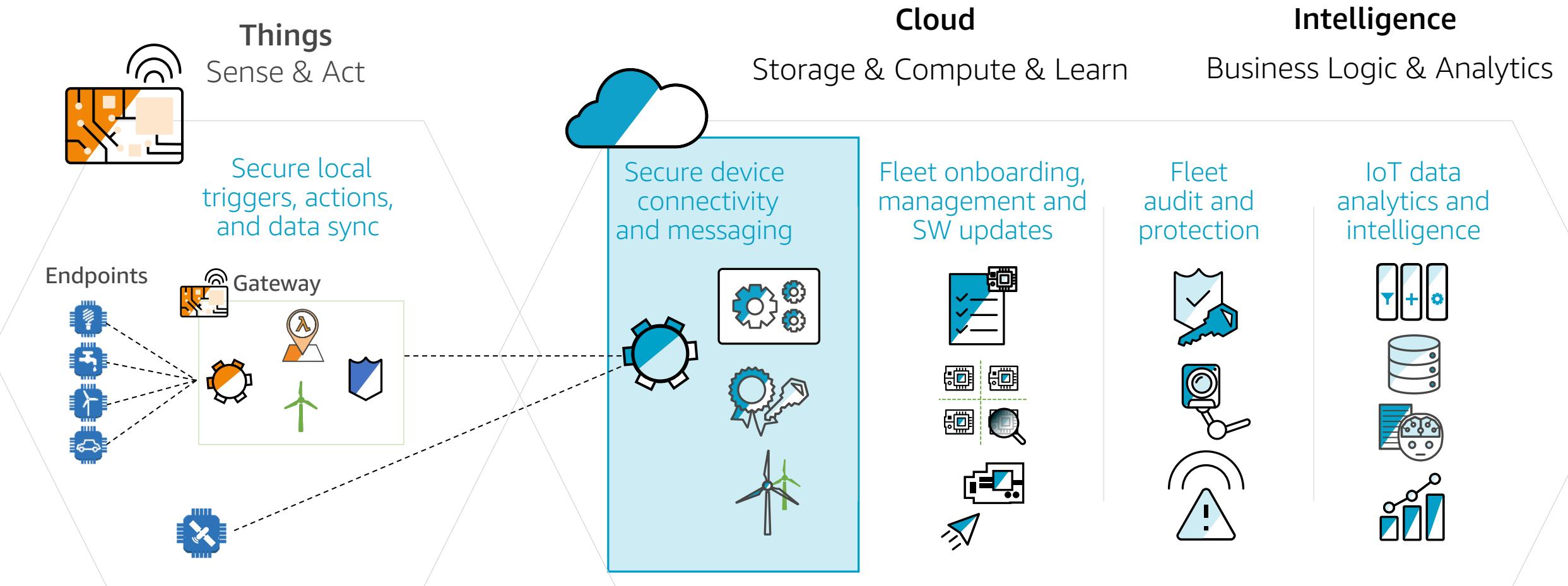
Six Business Challenges of Current IoT Projects



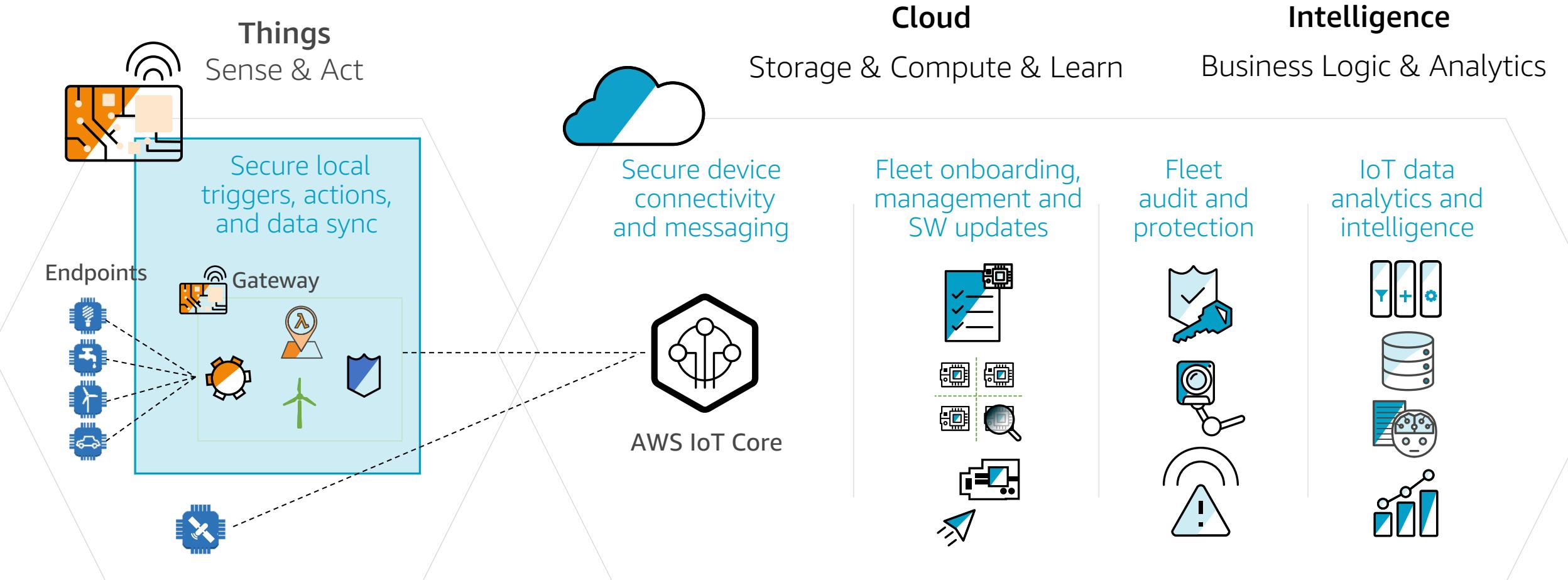
Solving IoT Business Challenges with the Extended AWS IoT Services Suite



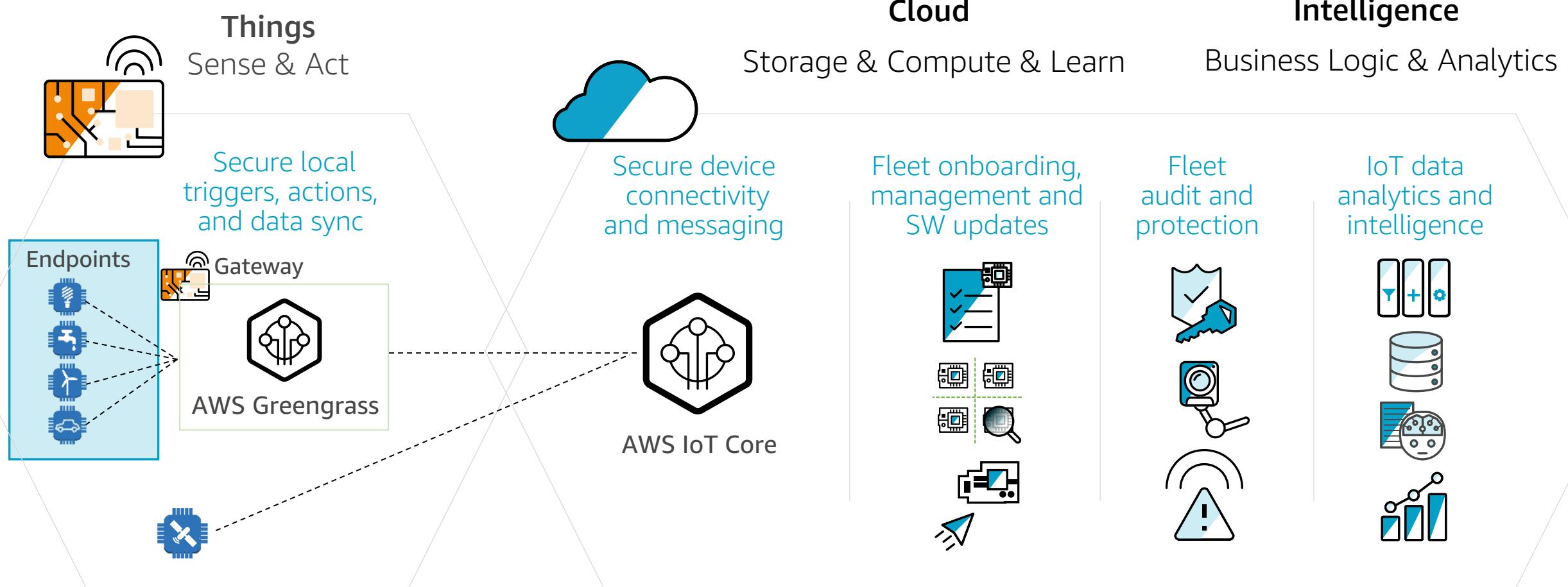
AWS IoT Architecture



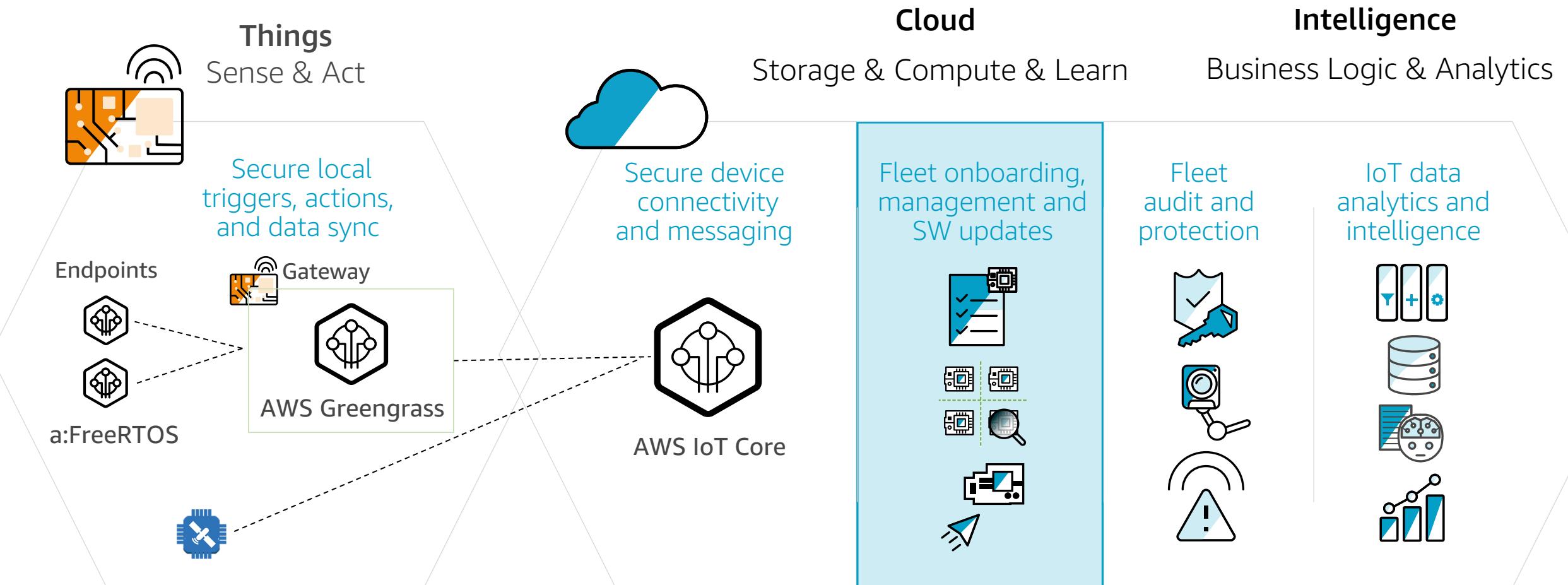
AWS IoT Architecture



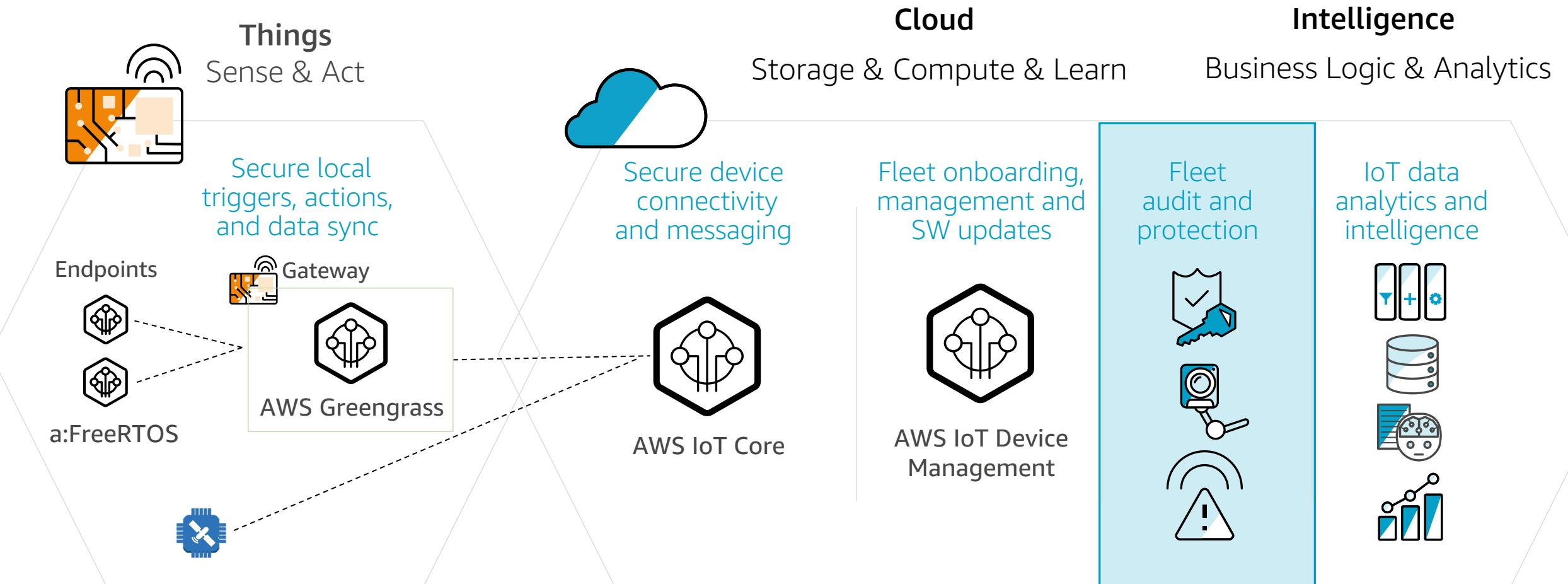
AWS IoT Architecture



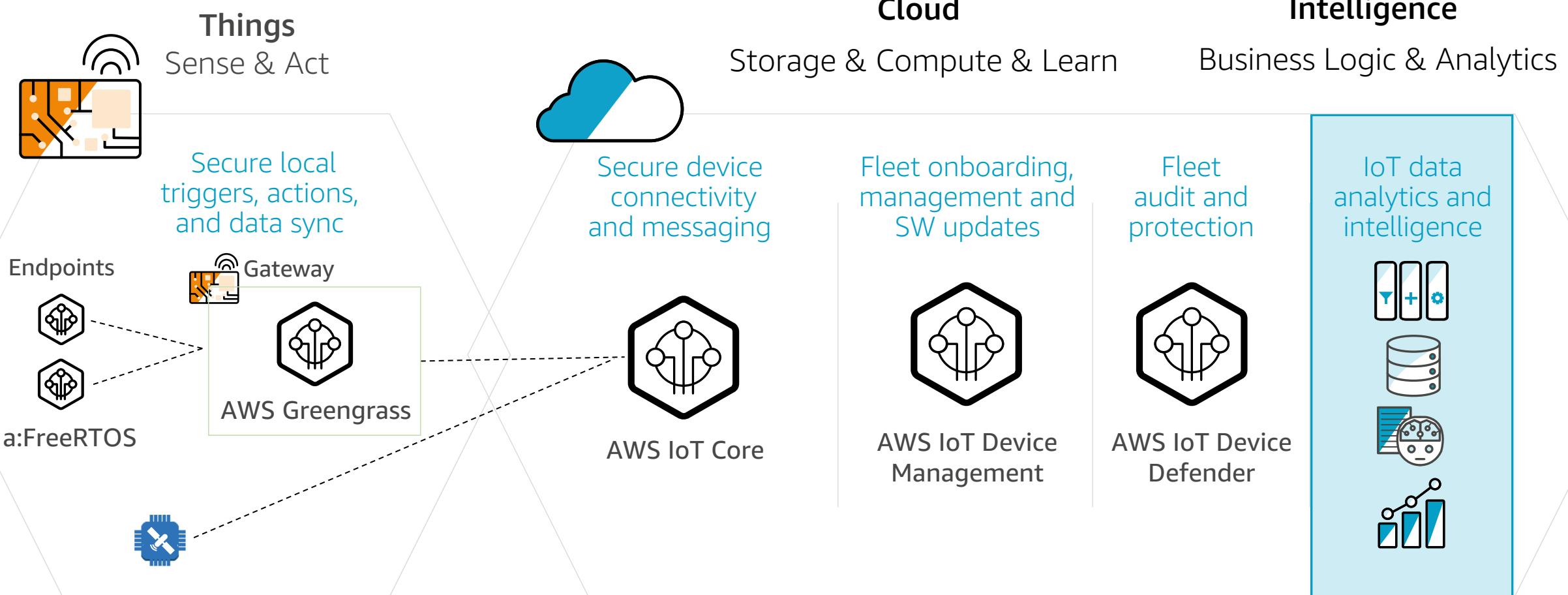
AWS IoT Architecture



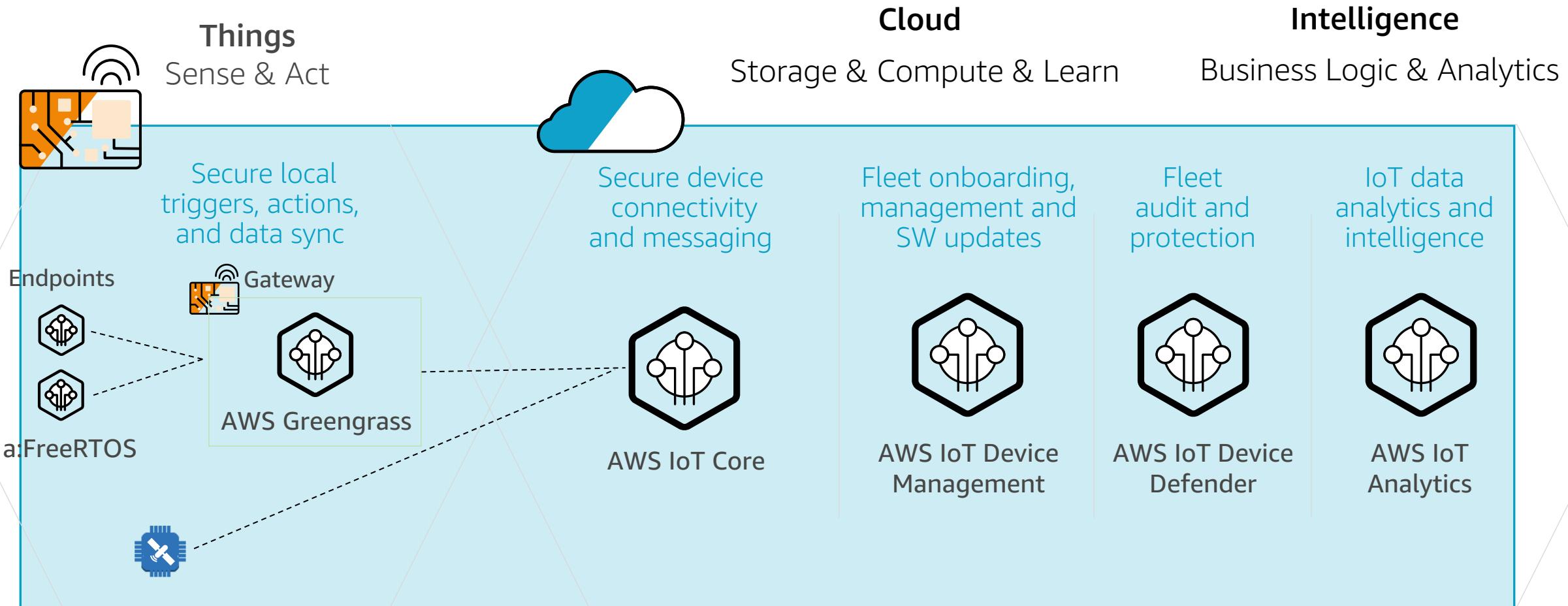
AWS IoT Architecture



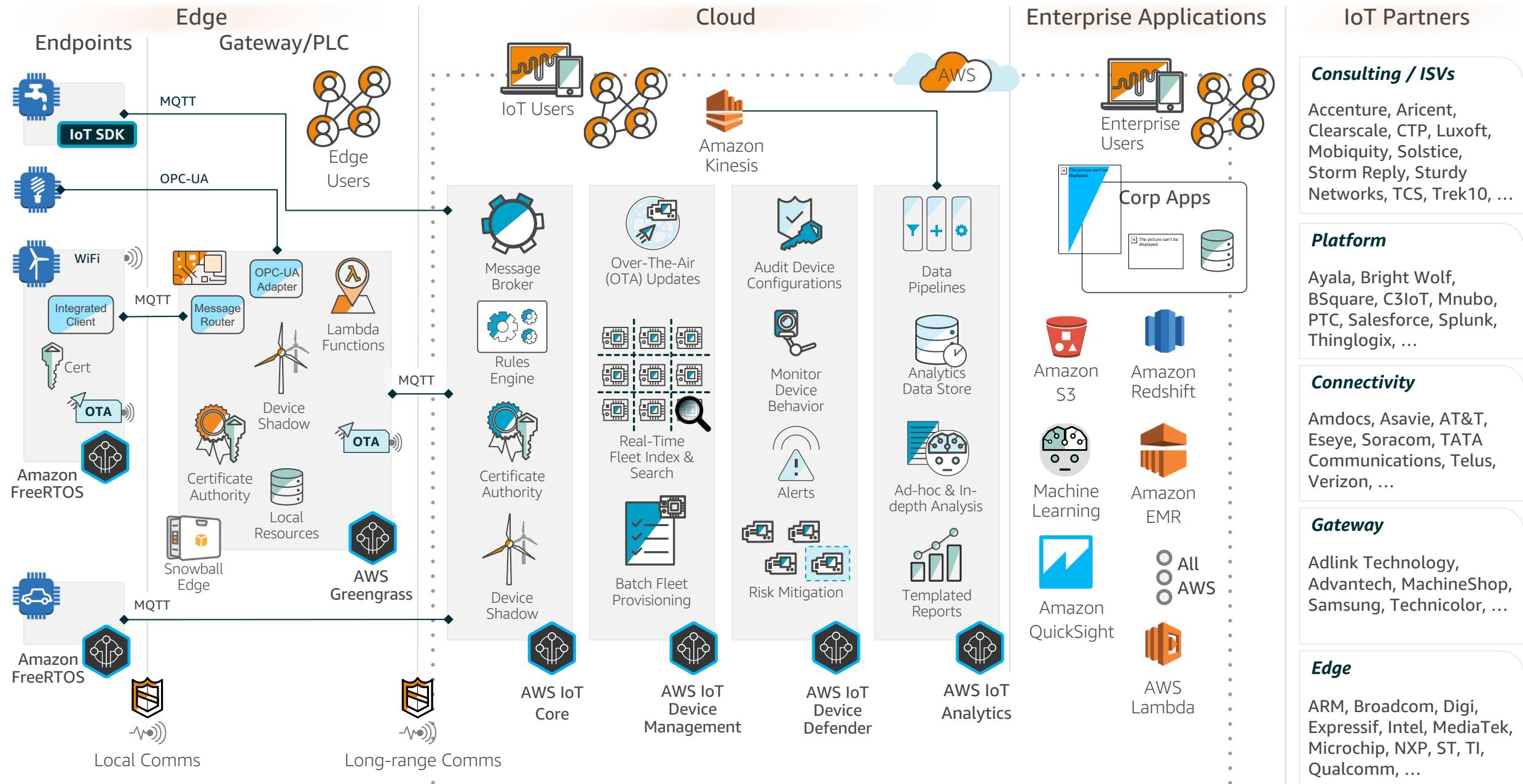
AWS IoT Architecture



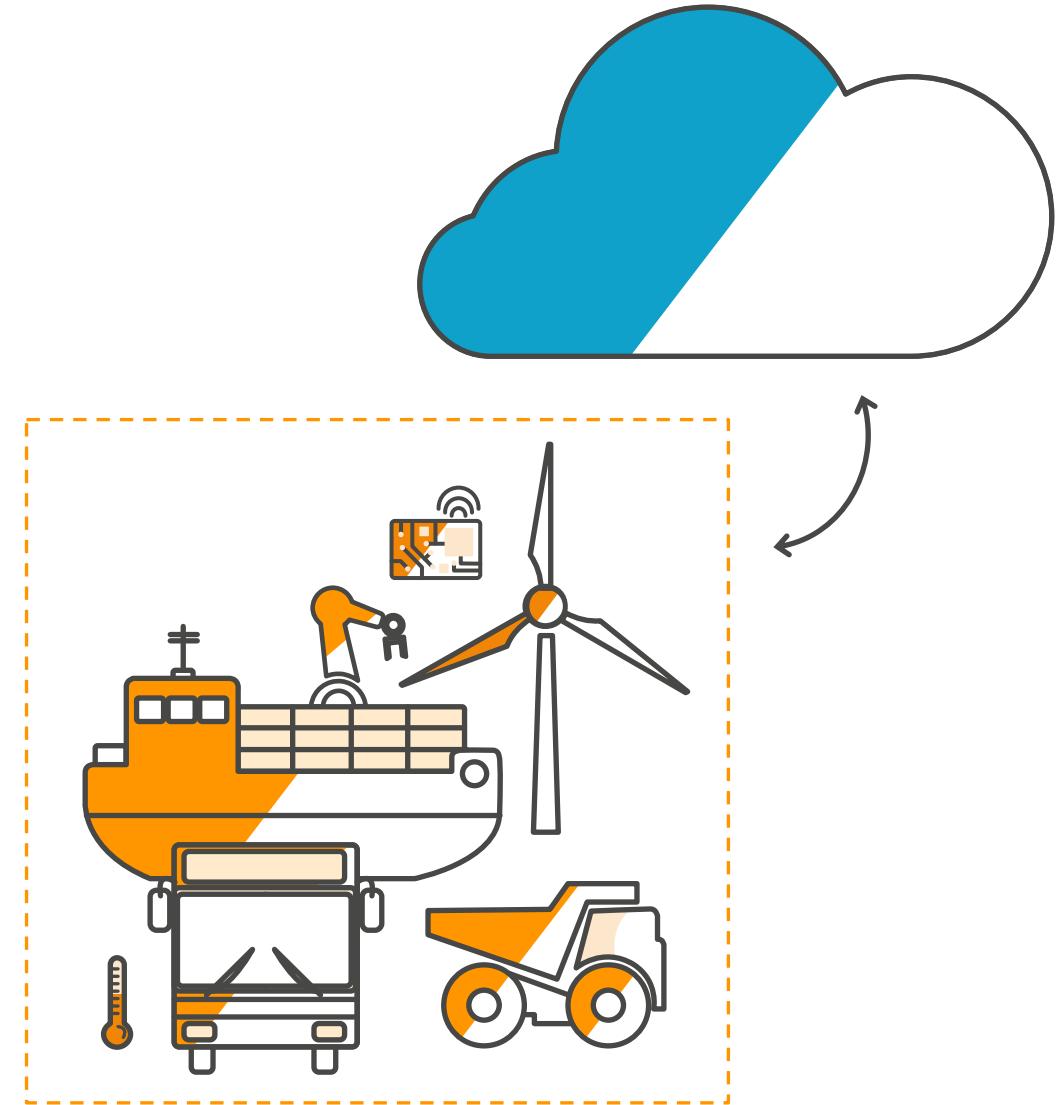
AWS IoT Architecture



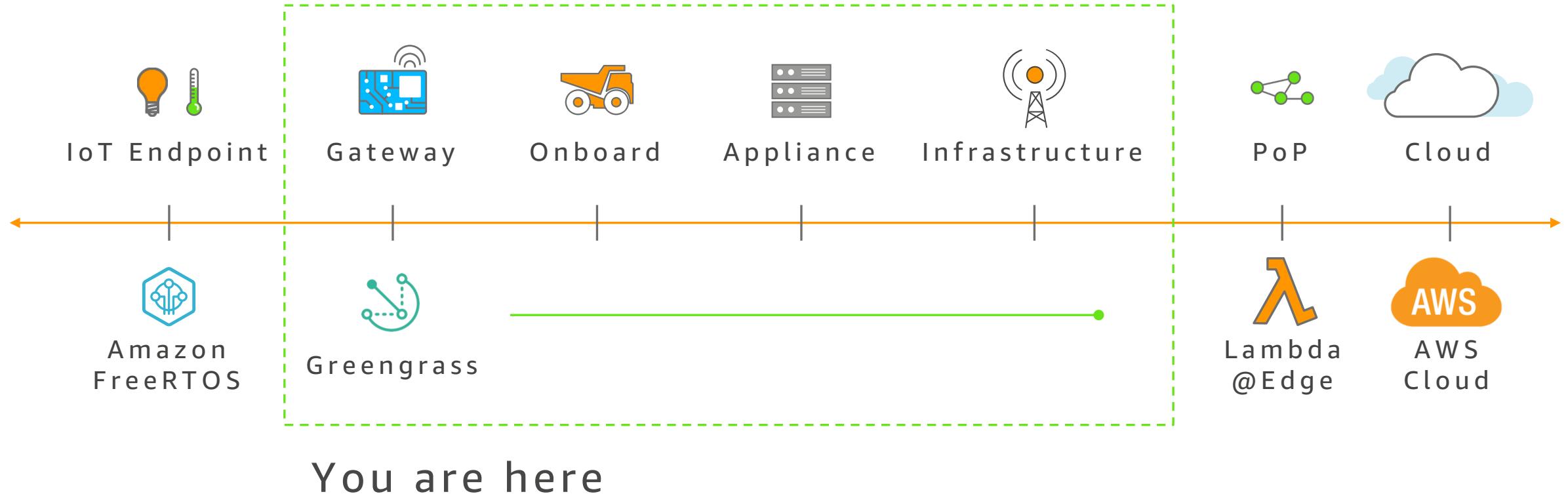
Helping customers to build their end to end vision of IoT



- IoT Edge Compute
- IoT Edge Communication
- Software Update

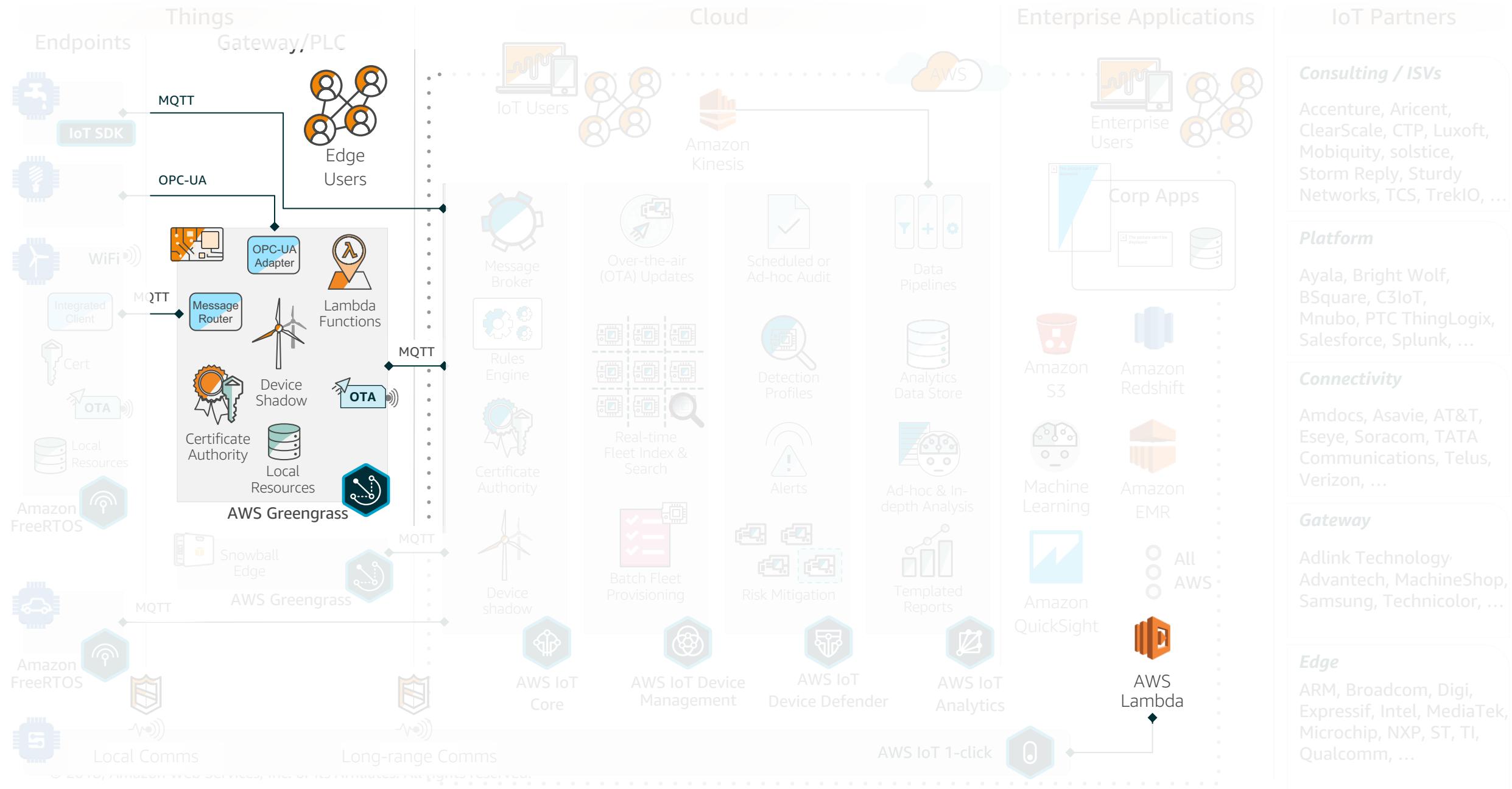


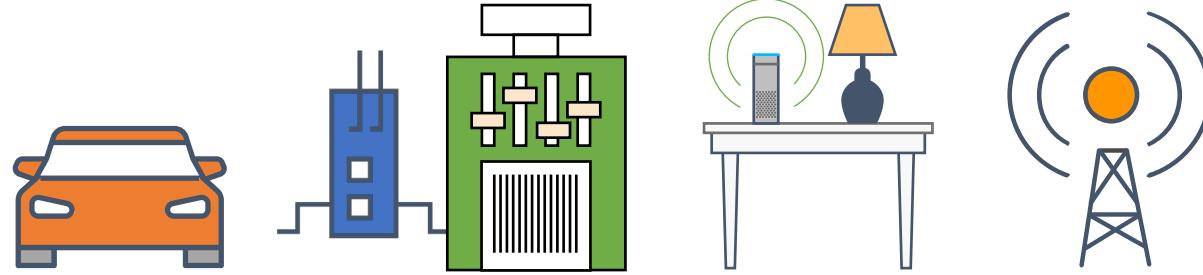
Where do I want to process data?





Helping customers to build their end to end vision of IoT





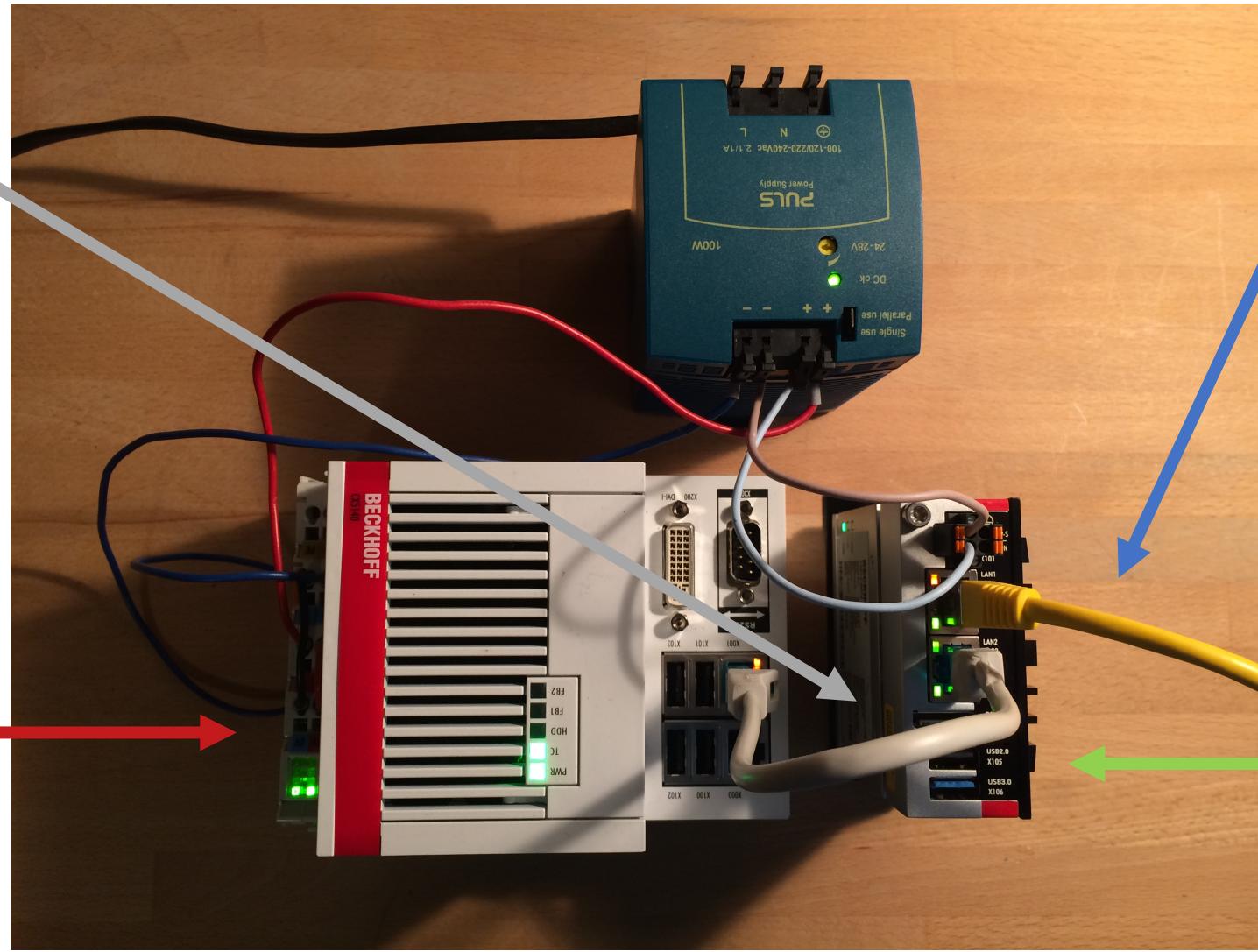
Demo: AWS Greengrass

Demo Setup

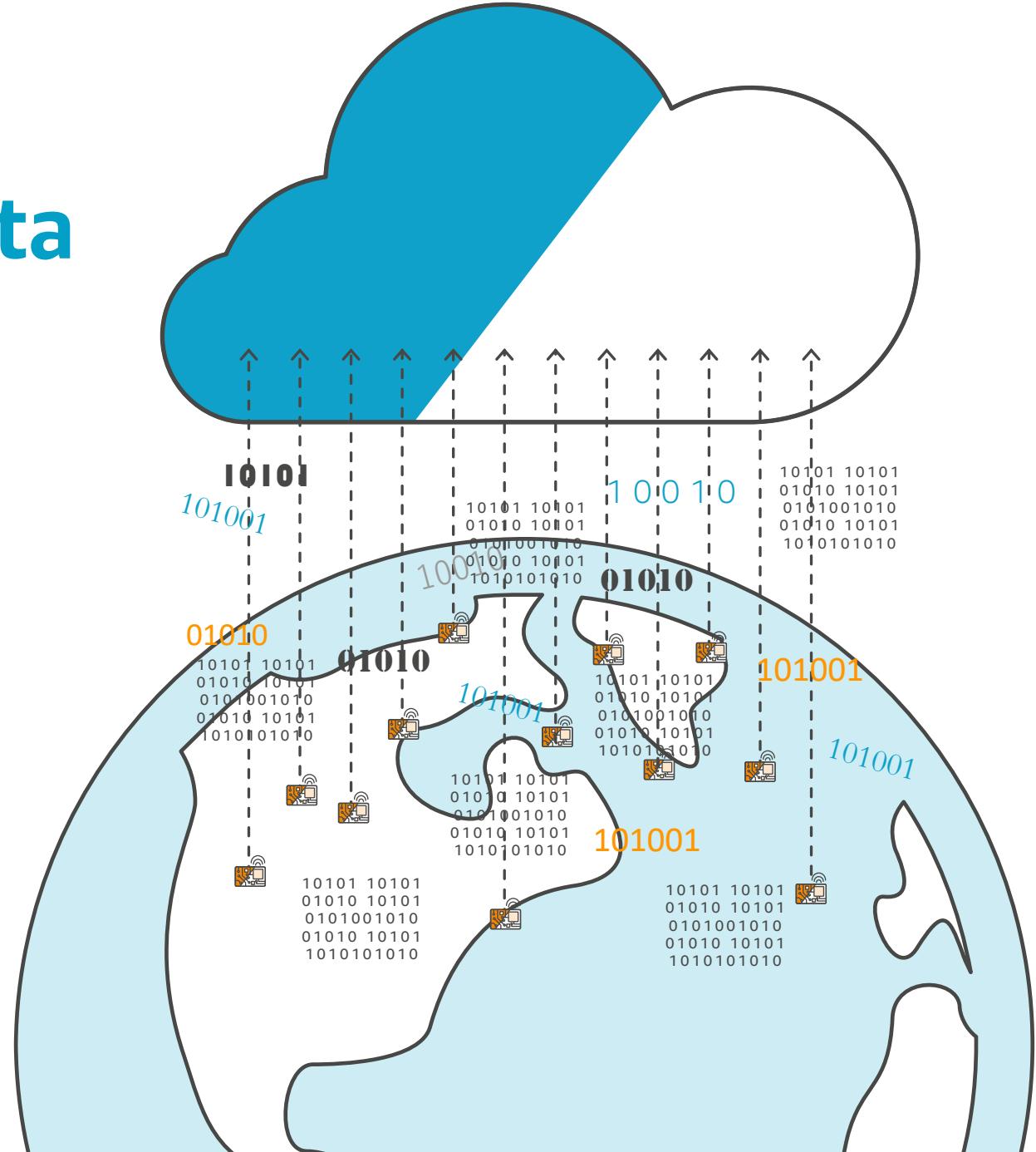
Simulated
OT
Network

Beckhoff
CX5140
PLC with
OPCUA
Server

Connectivity
to AWS

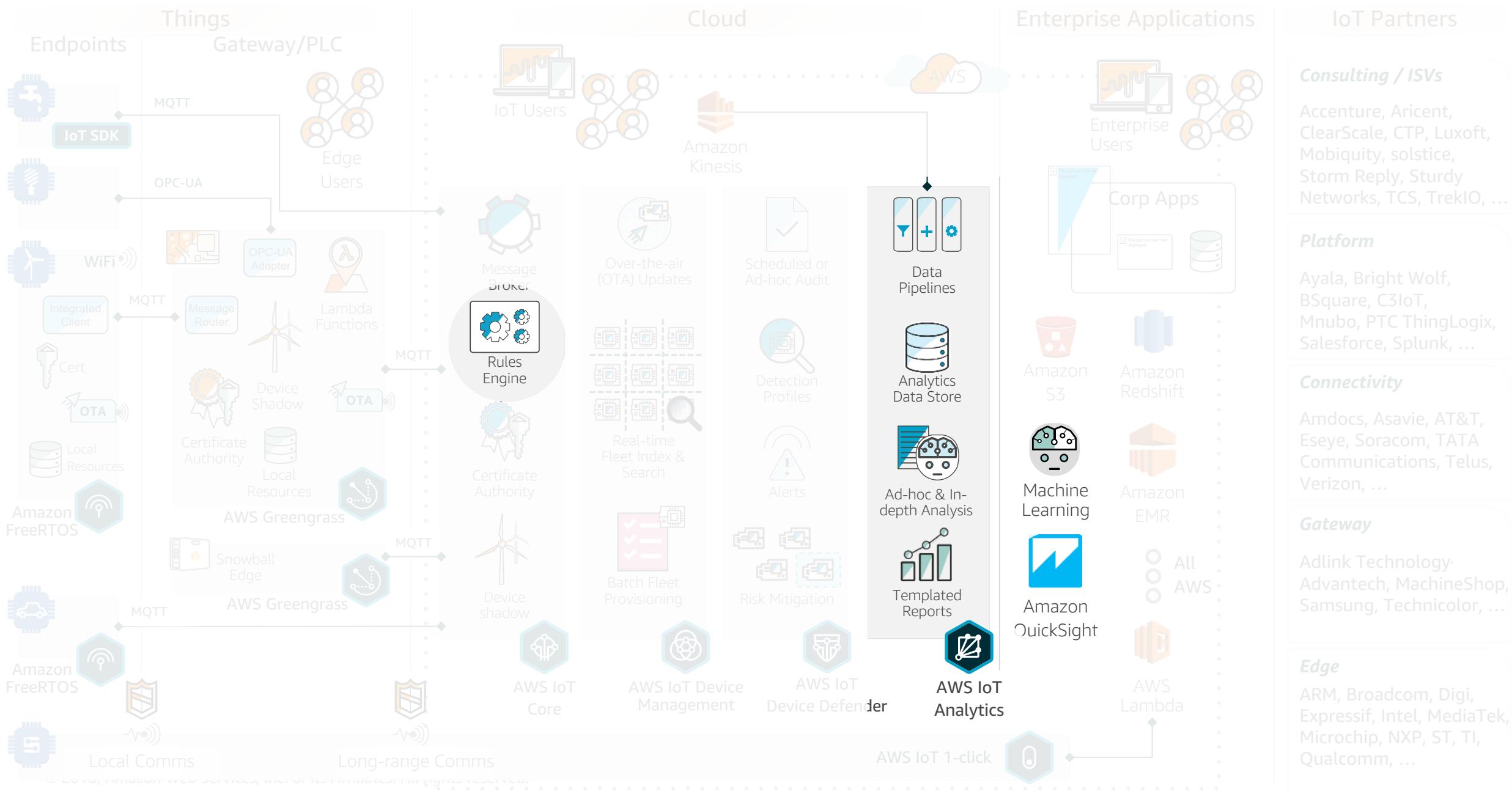


- **Transform/Enrich Data**
- **Long Term Storage**
- **Query Data**
- **Integrate with BI/ML**

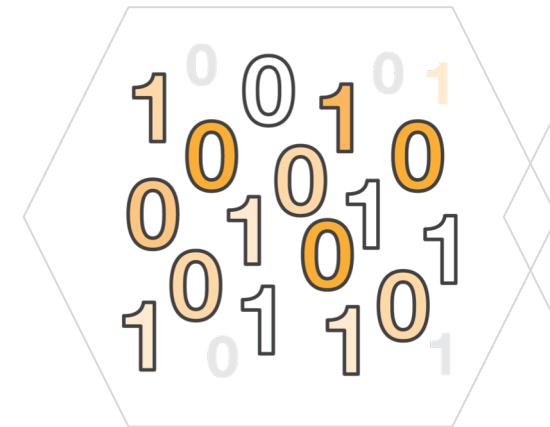




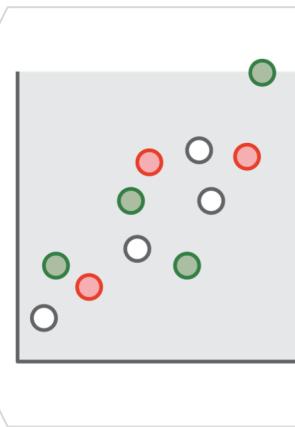
Helping customers to build their end to end vision of IoT



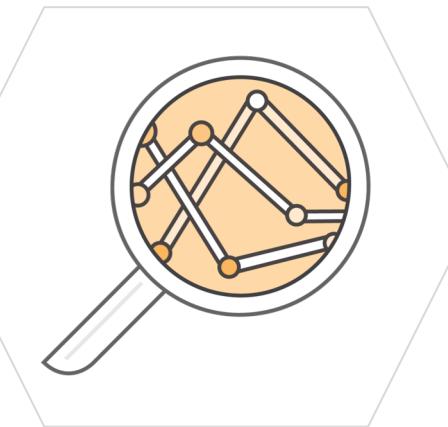
IoT Analytics Requirements



High Volume of
Data

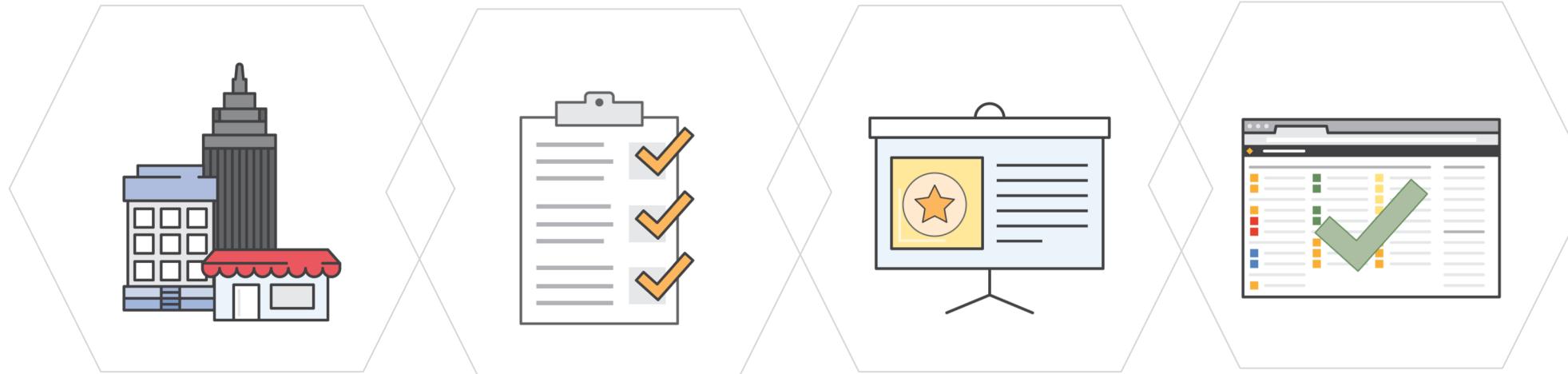


Clean Data



Contextual
Information

Why is IoT Analytics Important?



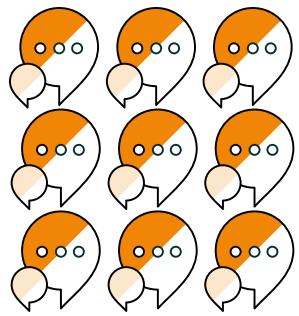
Industrial
automation

Improved product
design

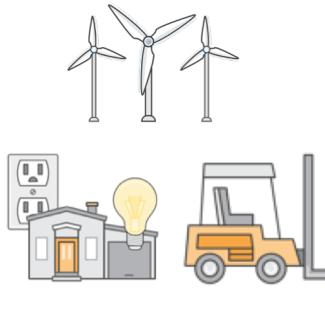
Optimized business
processes

Improved user
experience

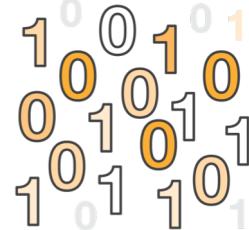
Challenges with IoT Data and Analytics



High Volume



Multiple Sources

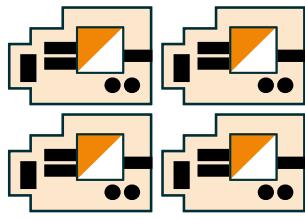


Noisy and No
Standard Format

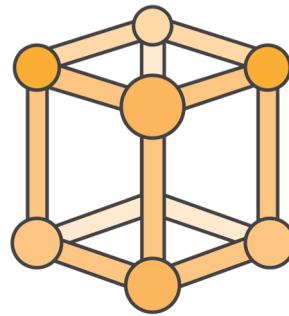


Incomplete and No
Contextual Information

What customers are asking for



Data collection from
multiple sources



Preprocessing
unstructured, noisy
data



Time series data
storage

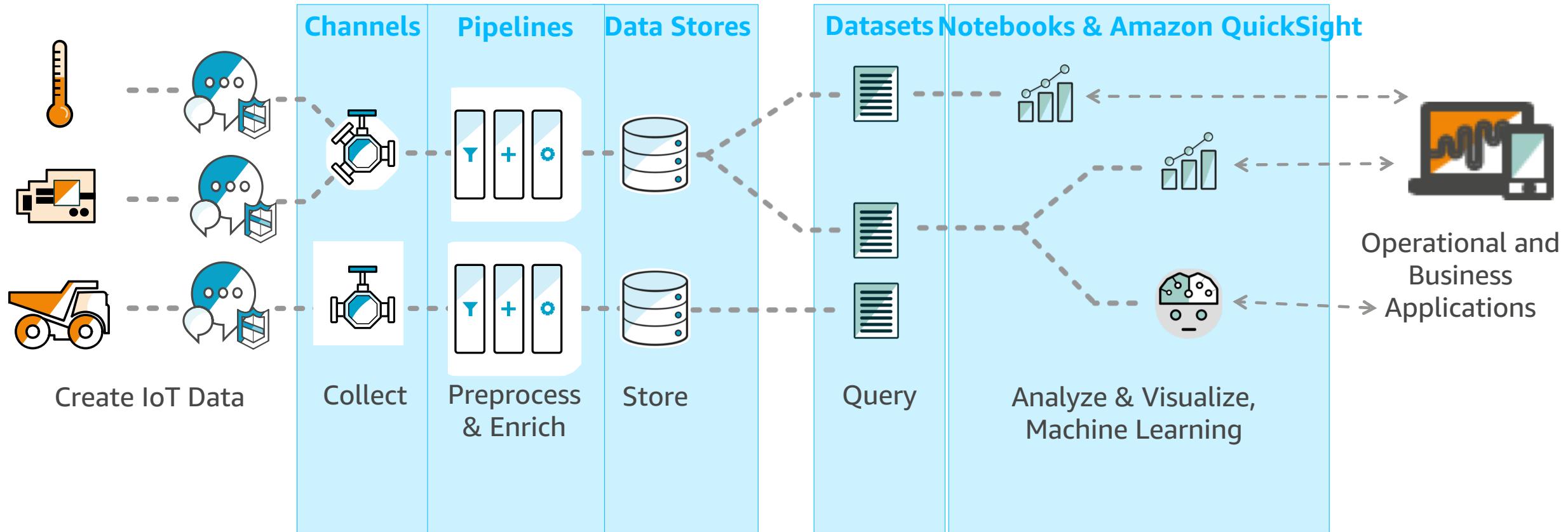


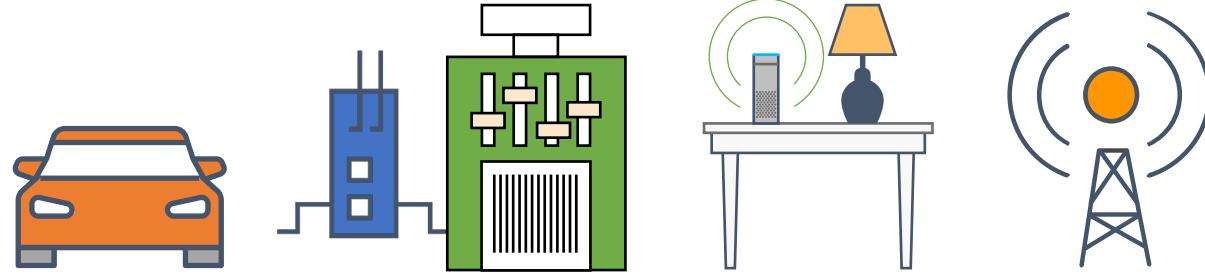
Advanced analytics
and machine
learning



Business relevant
reporting

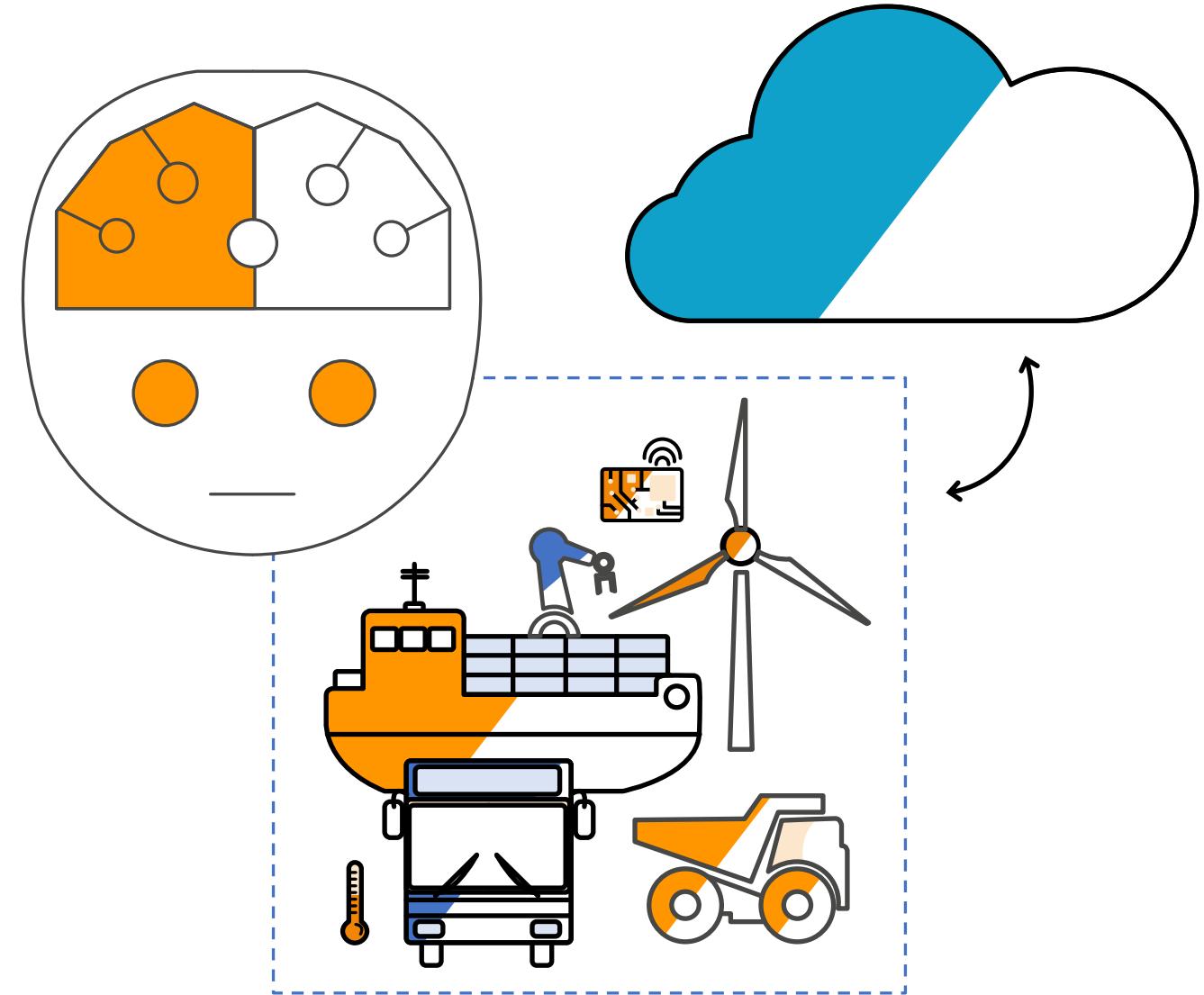
AWS IoT Analytics Components



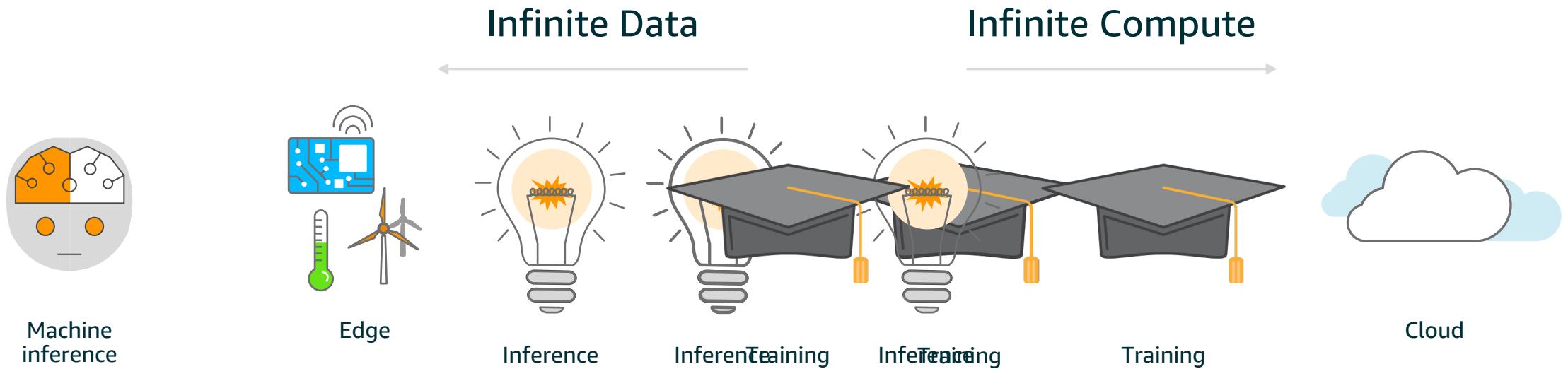


Demo: AWS IoT Analytics

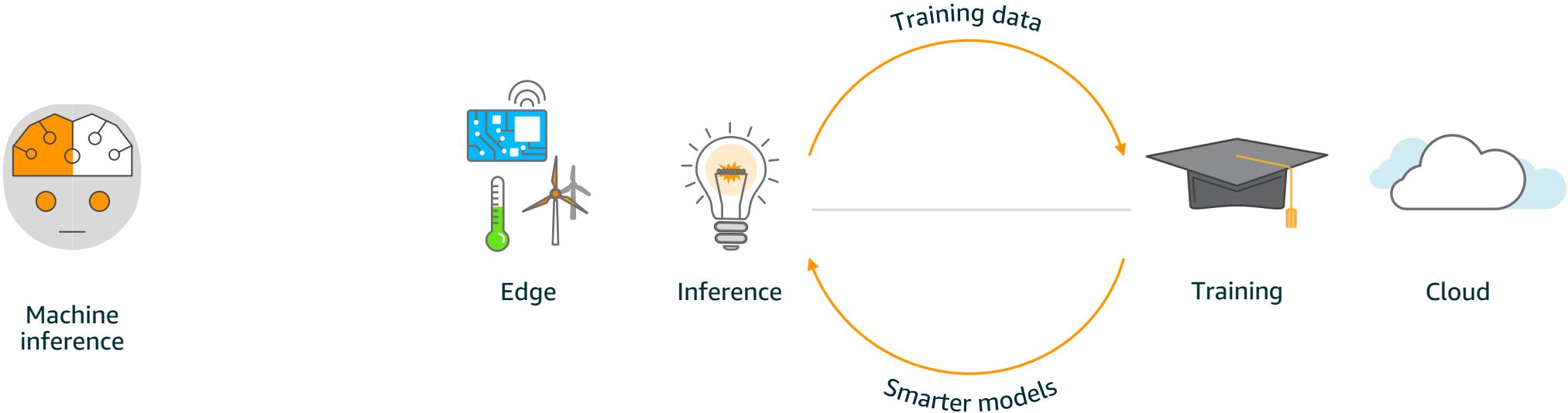
Prediction on the IoT Edge



AWS Greengrass ML Inference (preview)

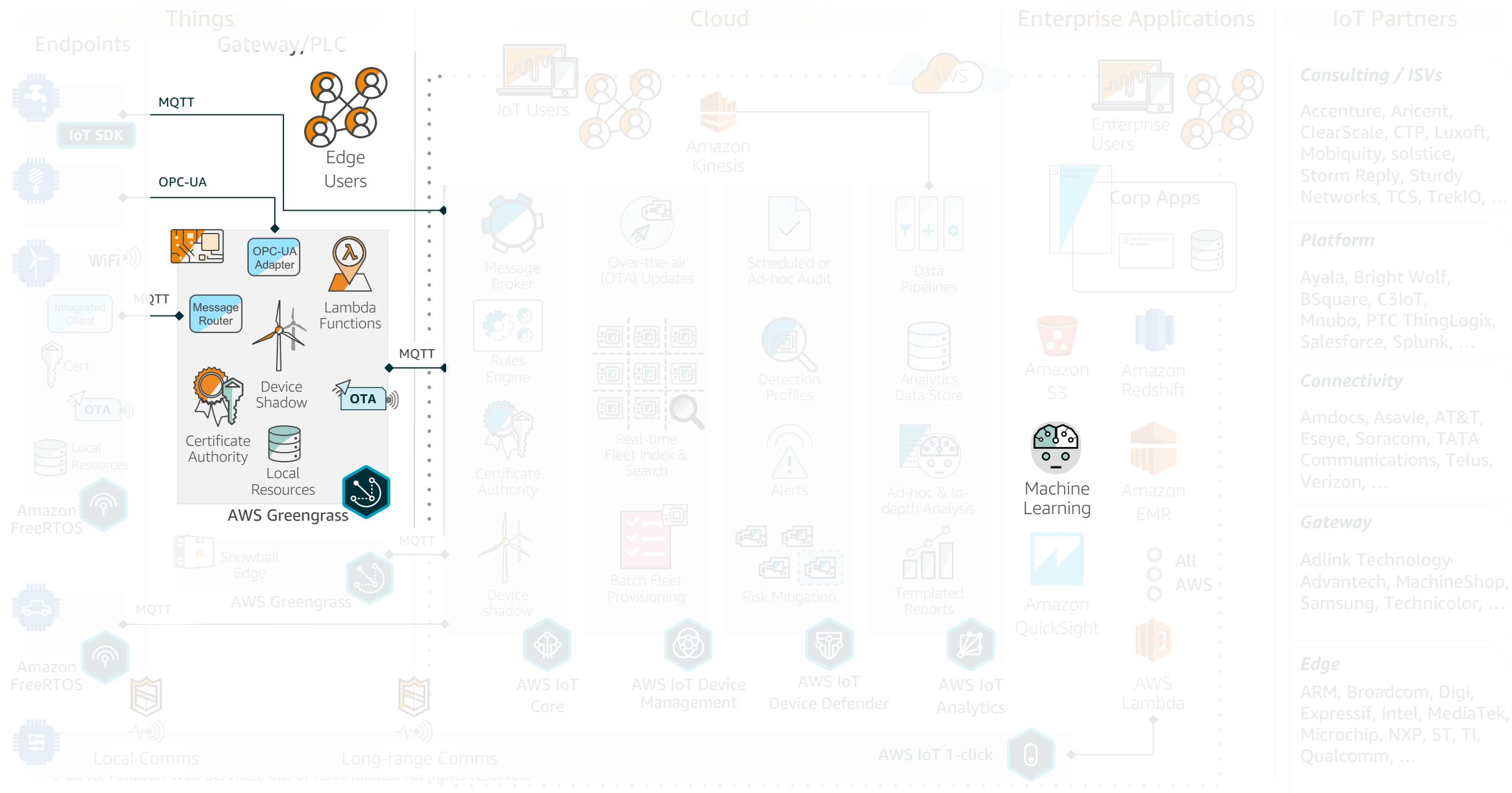


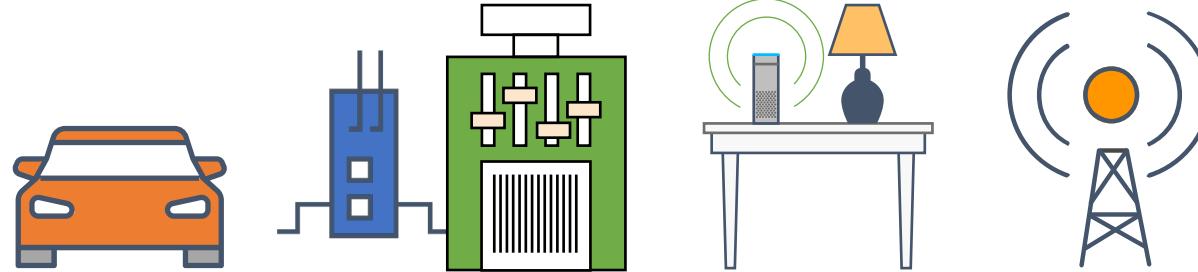
AWS Greengrass ML Inference (preview)





Helping customers to build their end to end vision of IoT





Demo: AWS Greengrass ML Inference

IoT at SKF

SKF Jens Greiner, Global Manager IoT Development

What is this session about?

- A real use case on how to make an existing product smart
- A real use case on how to enable fast analytics for data scientists



SKF – a truly global company

- Established 1907
- Sales 2016 SEK 72,787 million
- Employees 44,868
- Manufacturing units 108
- SKF presence 130 countries
- Distributors/dealers 17,000 locations
- Global certificates ISO 14001
OHSAS 18001 certification
ISO 50001

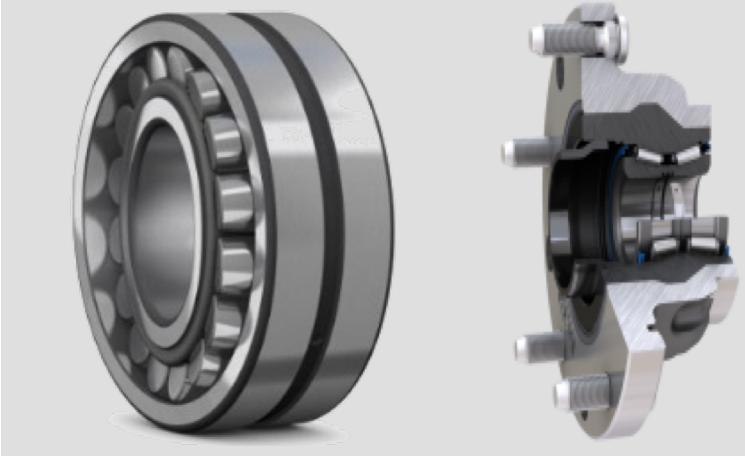


Two value propositions

**Rotating equipment
performance**



Product



Digital Business



User Value

- Smart Services



Service Layer

- Scalable , Reliable
- Secure
- Cost Efficient

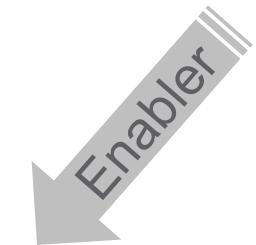
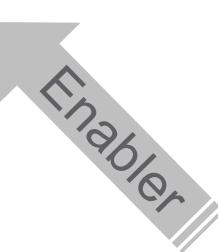


Powered by

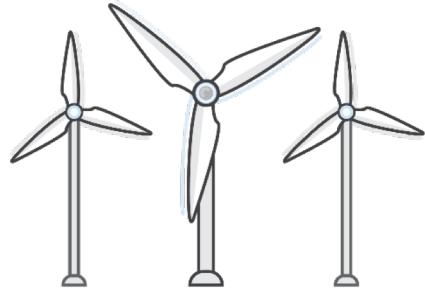


Asset Layer

- Smart Products



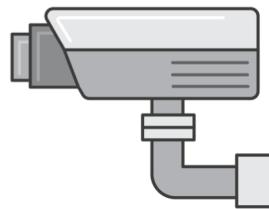
How to deal with unexpected analytic questions?



Existing analytic solution

1 0 0 1 0
0 0 1 0 0
0 1 0 1 0
0 1 0 0 1
1 0 1 1 0
1 0 1 0 1

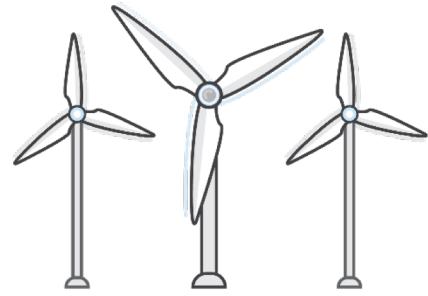
Unknown data set



Customer driven data set



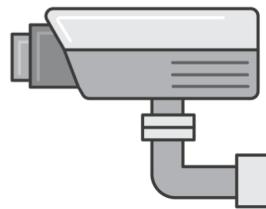
How to deal with unexpected analytic questions?



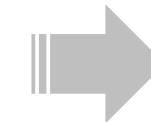
Existing analytic solution

A grid of binary digits (0s and 1s) arranged in a 6x6 pattern. The digits are colored in shades of orange, yellow, and grey.

Unknown data set



Customer driven data set

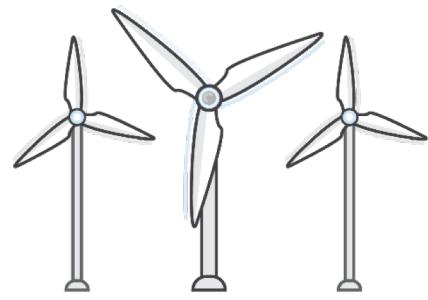


Magic should happen



To answer a question

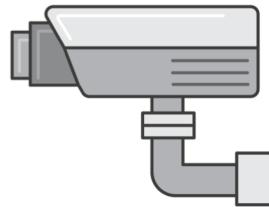
How to deal with unexpected analytic questions?



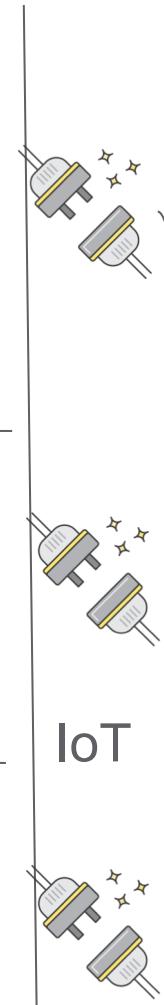
Existing analytic solution

1 0 0 1 0 1
0 1 0 1 0 0
0 1 0 1 0 1
1 0 1 1 0 1

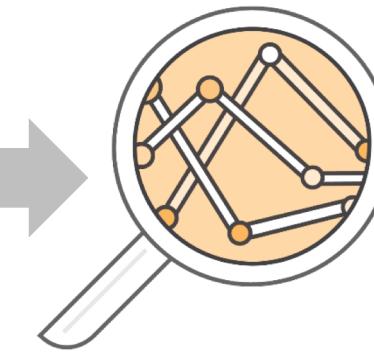
Unknown data set



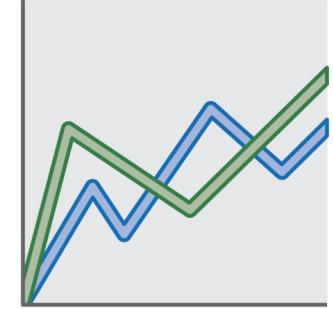
Customer driven data set



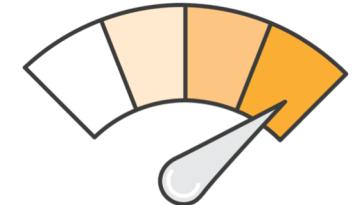
Data Lake



Analytics

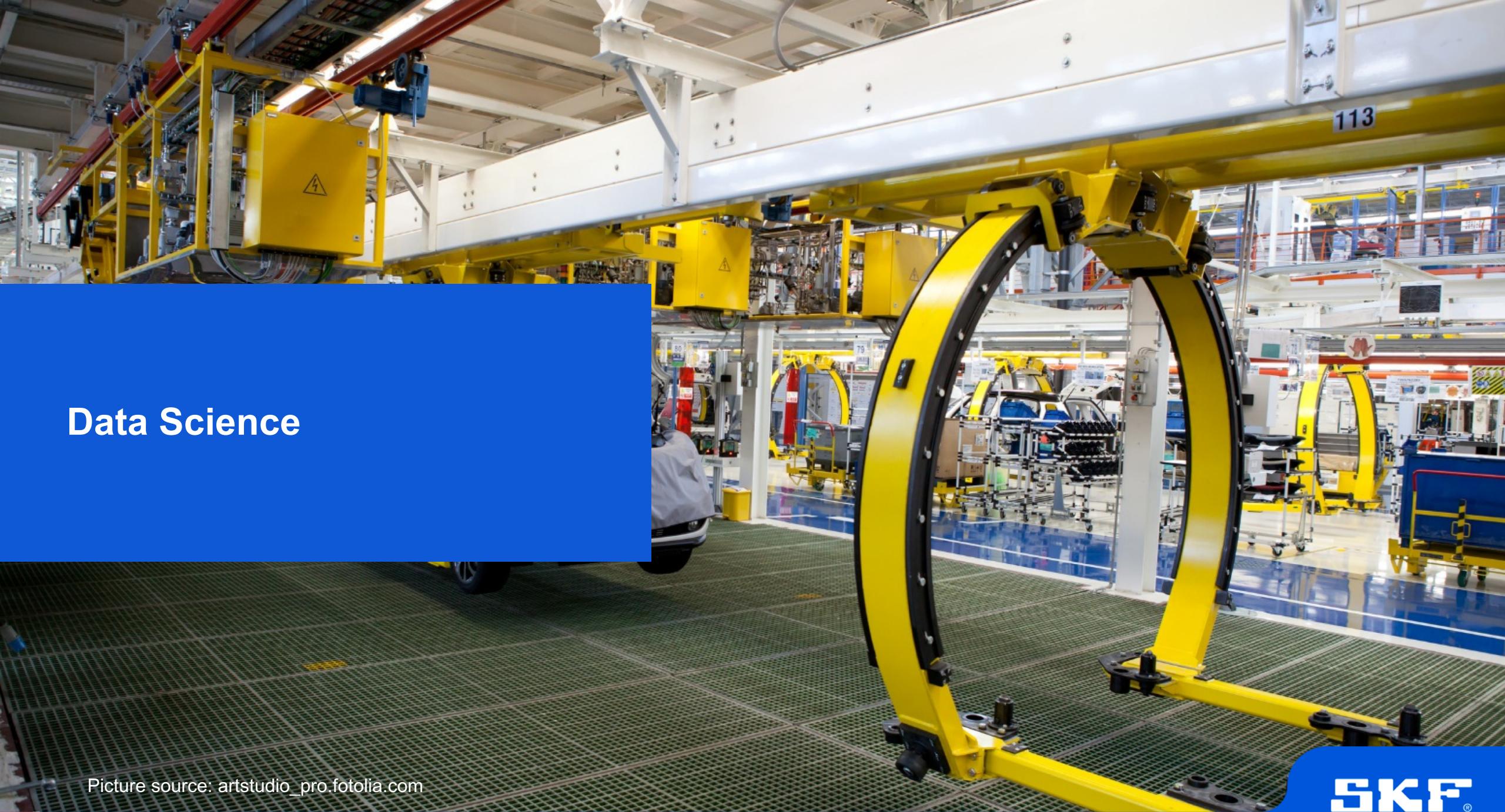


Insights



Decisions

Data Science



Picture source: artstudio_pro.fotolia.com

SKF[®]

Deep Learning on Data Lake

Goal

Identify defects on conductor rails in real time

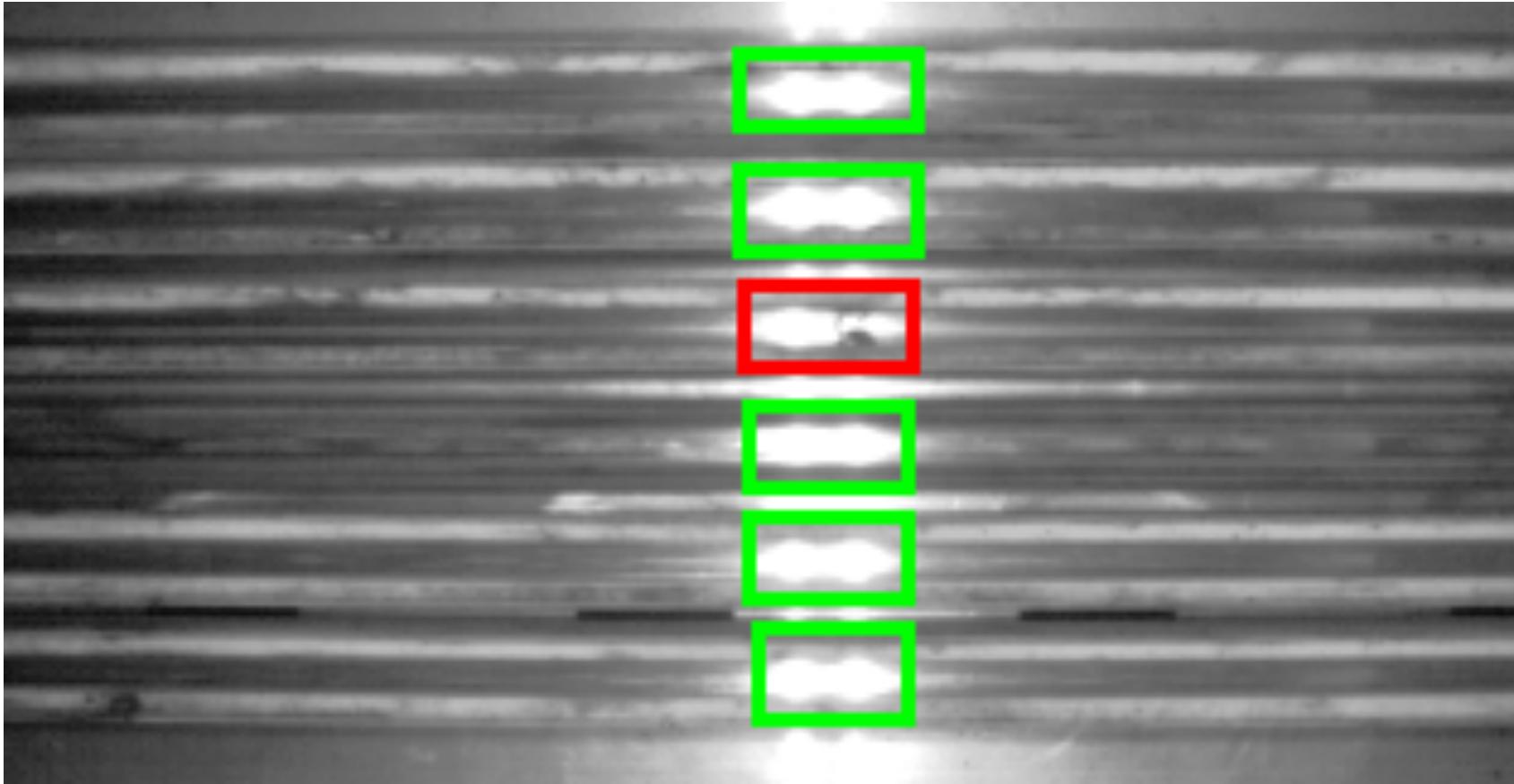
Solution

- Condition monitoring is collecting several data in real time
- High resolution camera is taking photos continuously

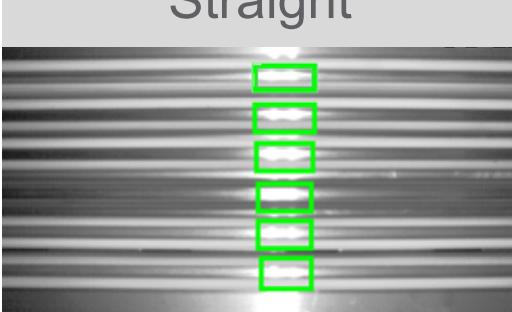
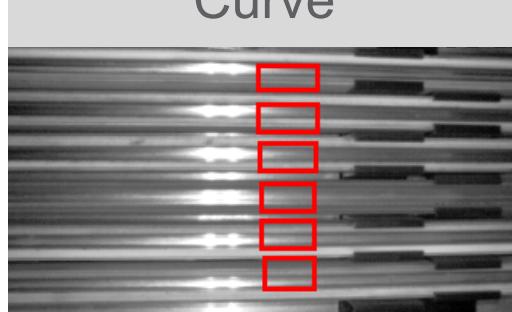
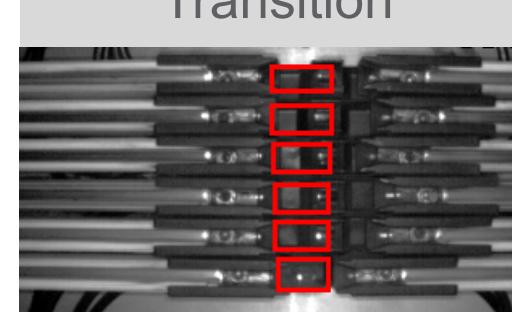
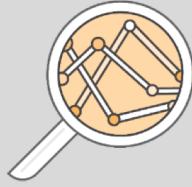
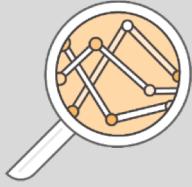


Source: artstudio_pro.fotolia.com

What are we searching for?

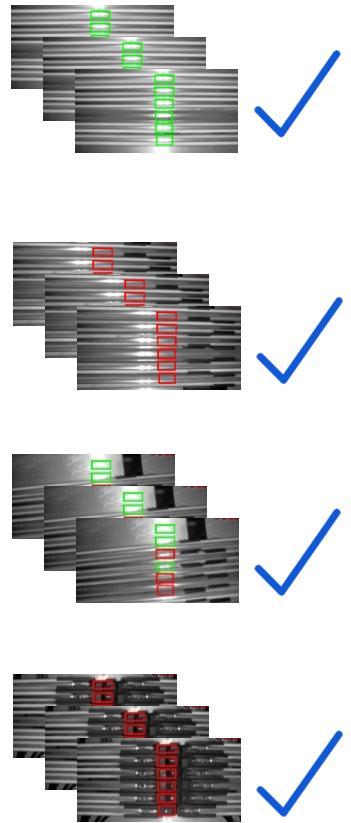


Classify images for analytics

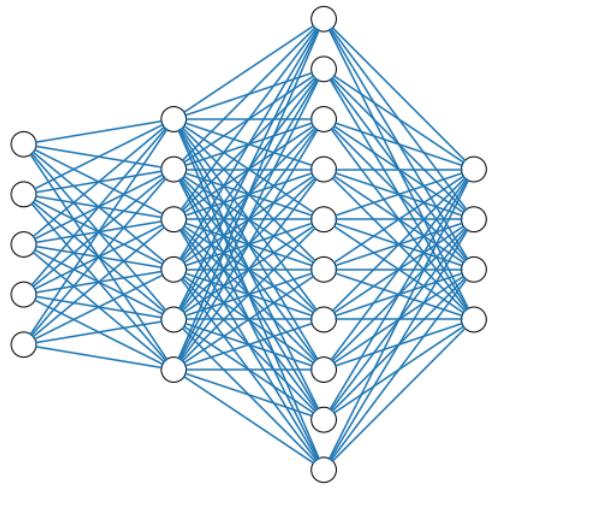
Classes			
Straight	Curve	Slope	Transition
			
 Analytics	 Pre-processing	 Pre-processing	
	 Analytics	 Analytics	Not used for analytics

Efficient labeling using Deep Learner

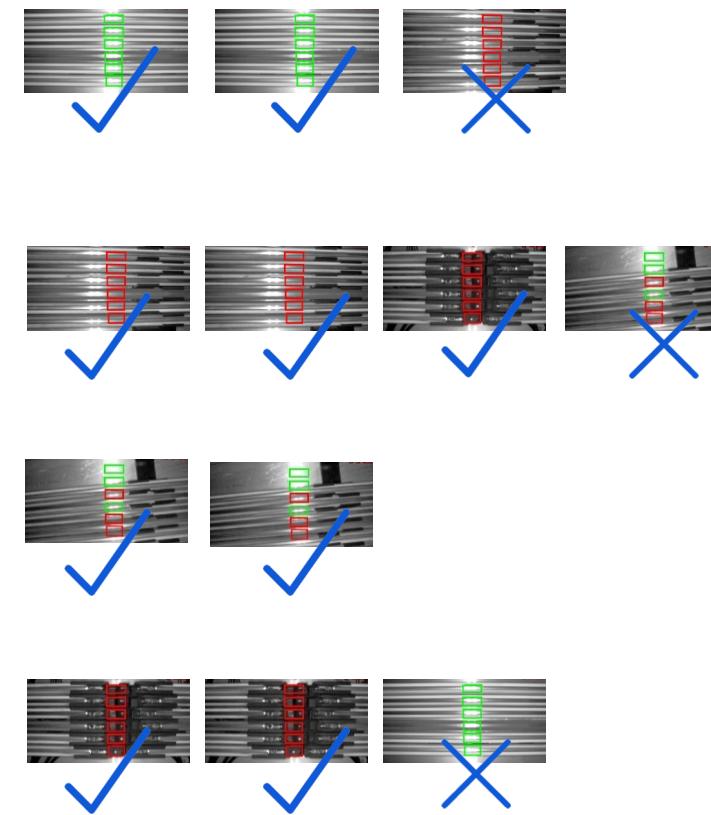
Manual label images



Deep Learner

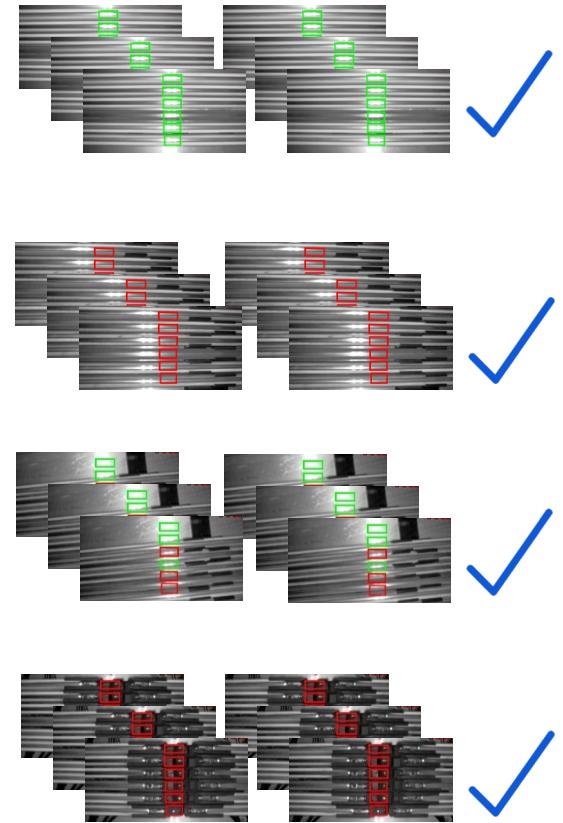


Automated labeled images



Classifier Model with Deep Learner

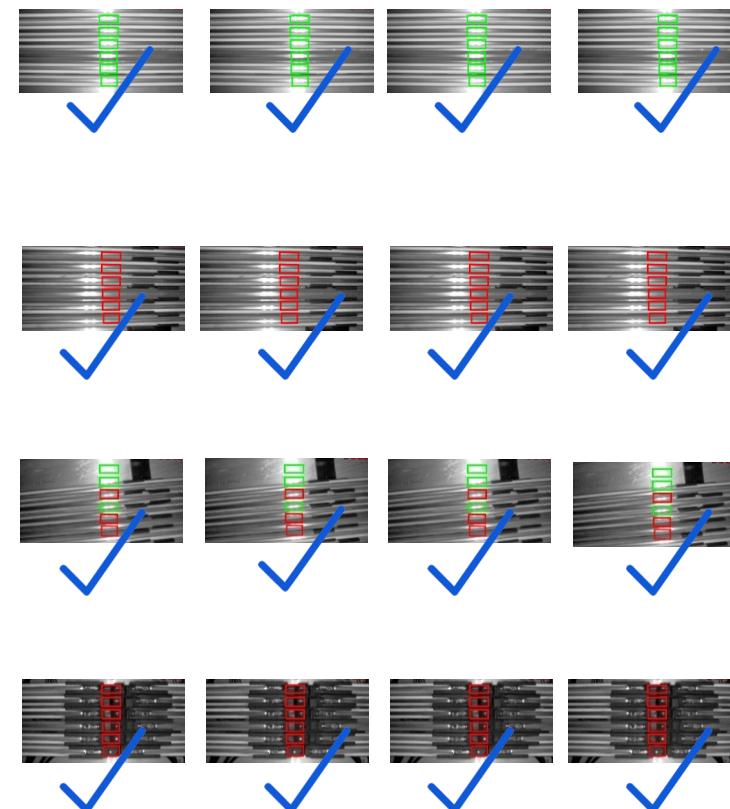
Automated & manual
approved labeled images



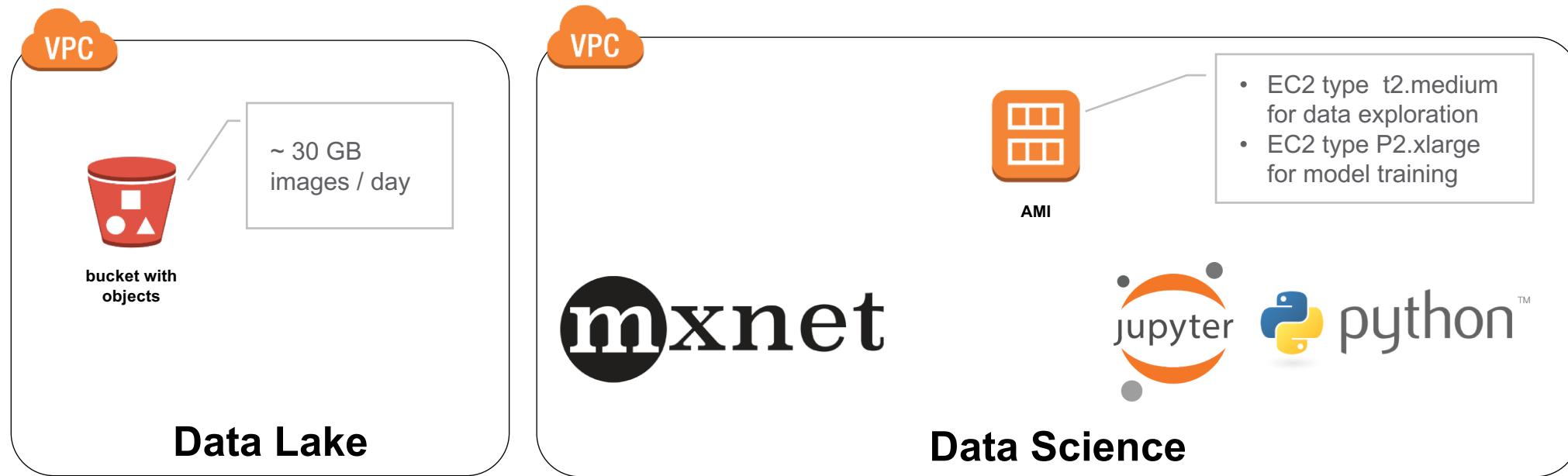
Deep Learner



Classifier Model 99,9% accuracy



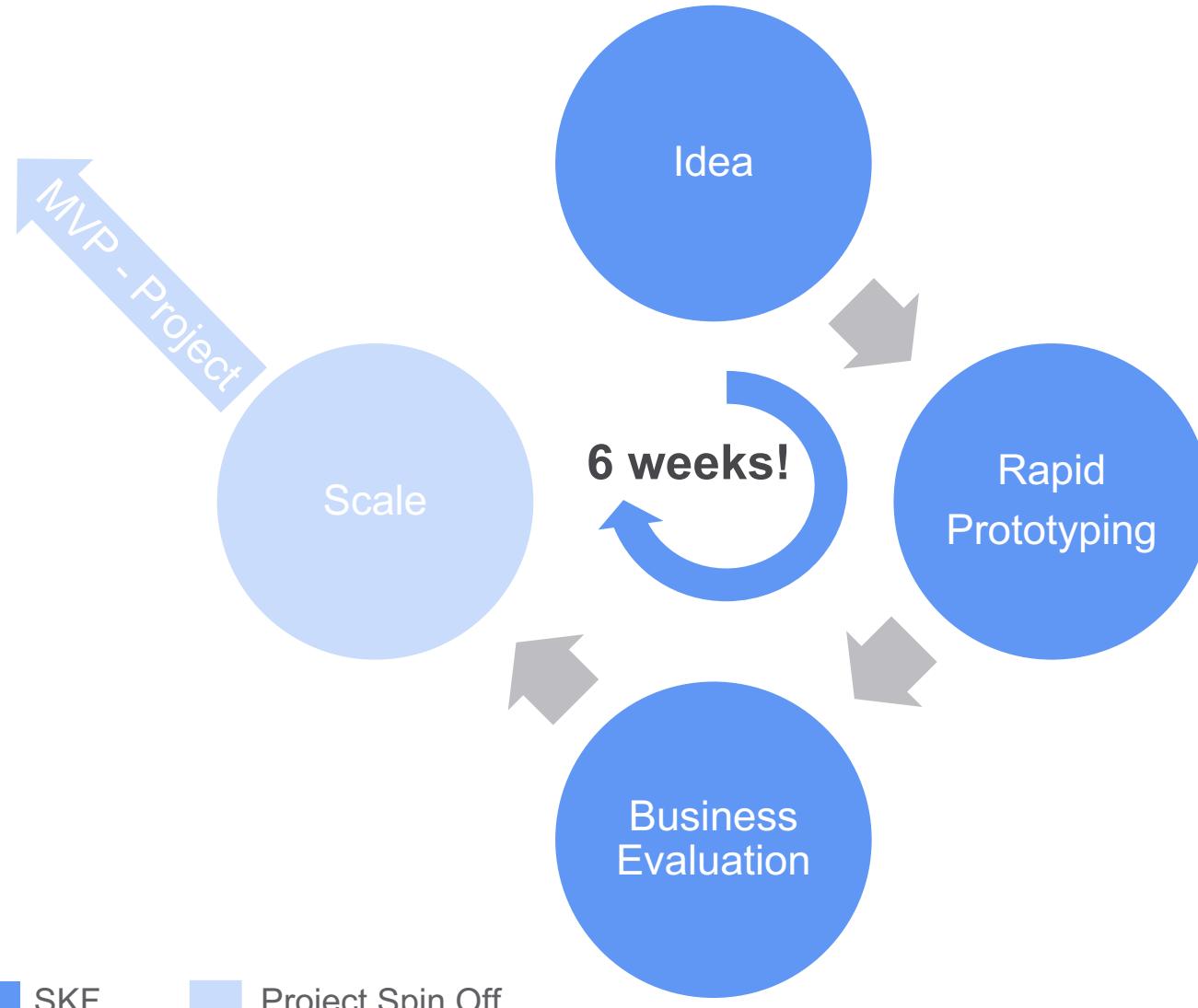
AWS Environment

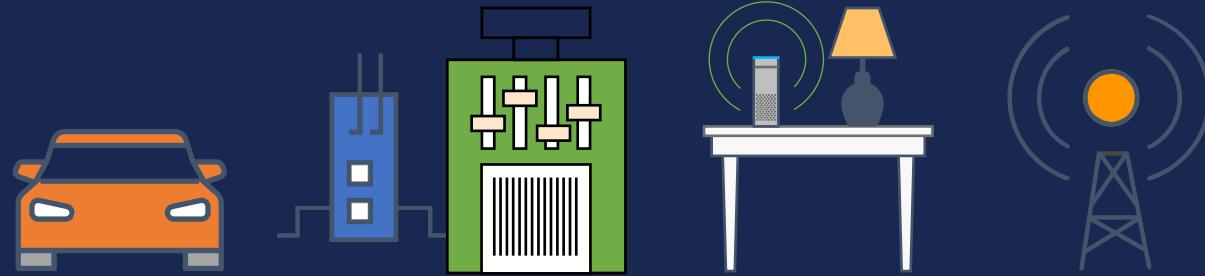


- ✓ Complete classification was done in a few hours
- ✓ Total spend on AWS resources ~ 1\$
- ✓ Analytic model deployed onto edge device (Docker image or AWS Greengrass)

Digital Platform Rapid Prototyping

- DevOps teams
- SKF domain experts
- Partnerships





Thank you! Questions?

For more information visit: aws.amazon.com/iot/