



INNOVATE2018

ONLINE CONFERENCE



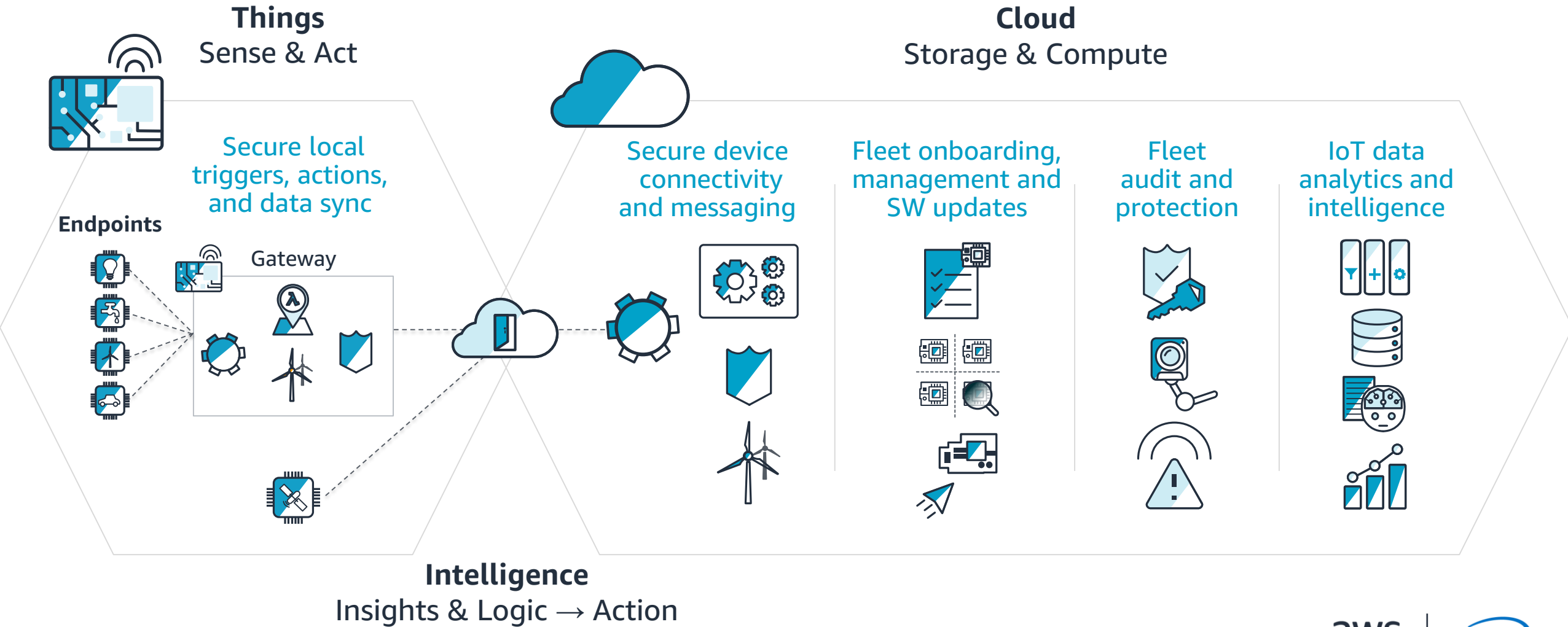
Managing Complexities of IoT Workloads at Scale (Level 300)

Timothée Cruse, IoT Solution Architect

What we'll discuss

- Quick review of AWS IoT Suite of services
- Security
- Device management
- On-boarding
- Analytics
- Solutions

AWS IoT Architecture





AWS IoT Core

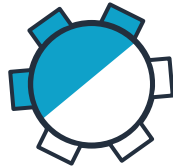
Secure Device Connectivity and Messaging



Identity
Service



Device
Gateway



Message
Broker



Rules
Engine



Device
Shadow



Registry



Amazon FreeRTOS

IoT Microcontroller OS



Based on FreeRTOS kernel



Amazon FreeRTOS

IoT Microcontroller OS



Local Connectivity
Libraries



AWS Greengrass



Cloud Connectivity
Libraries



AWS IoT Core



Security
Connectivity
Libraries



OTA ^{Beta} &
Code Signing

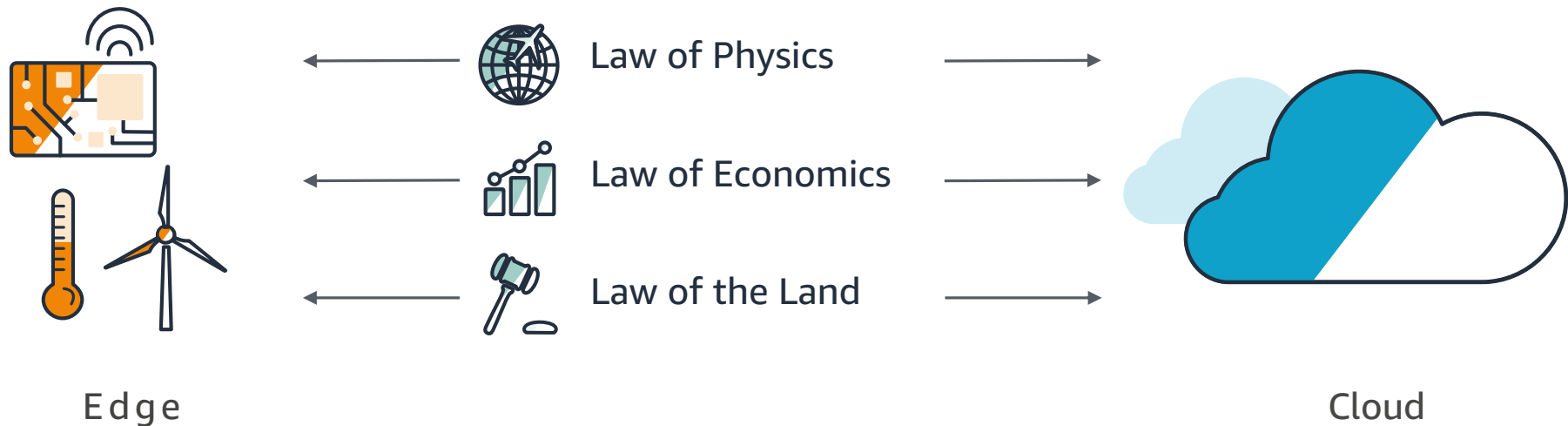


Based on FreeRTOS kernel

AWS Greengrass

Extend AWS IoT to the Edge

AWS Greengrass extends AWS IoT onto your devices, so that they can act locally on the data they generate, while still taking advantage of the cloud.

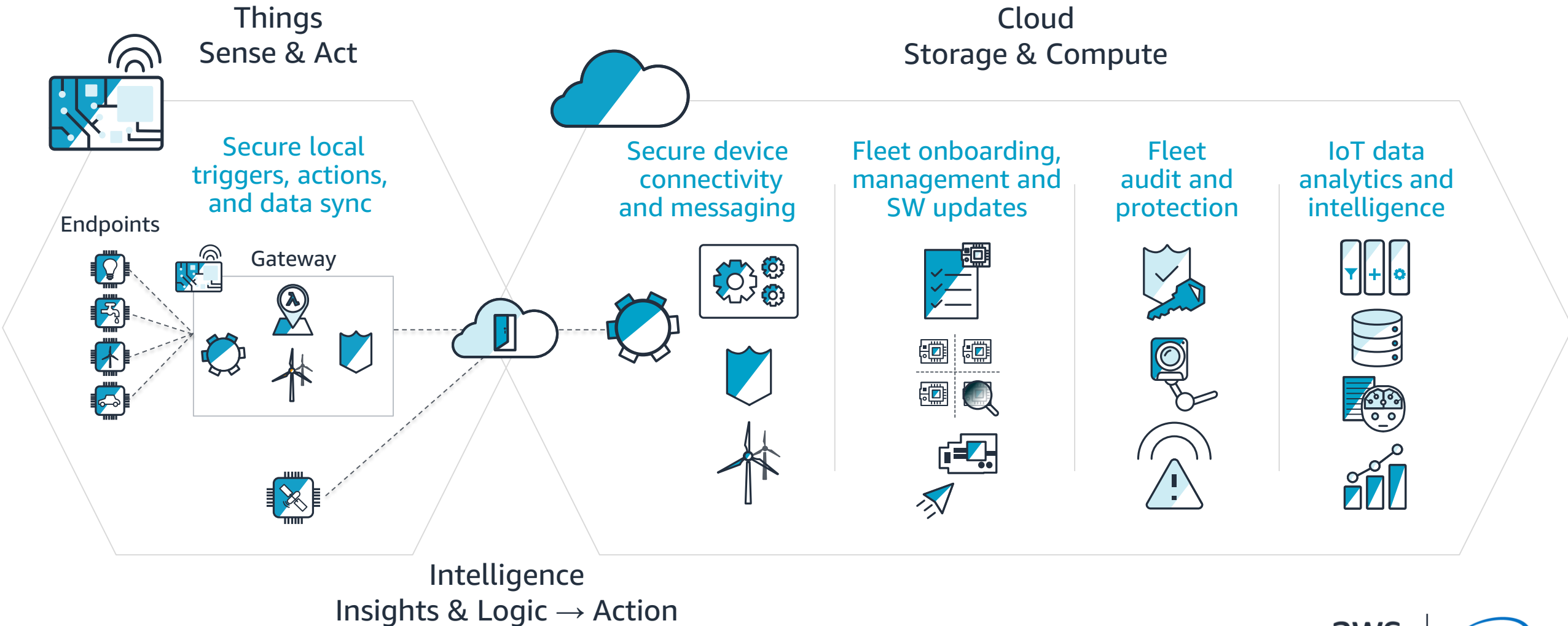




Extend AWS IoT to the Edge



AWS IoT Architecture



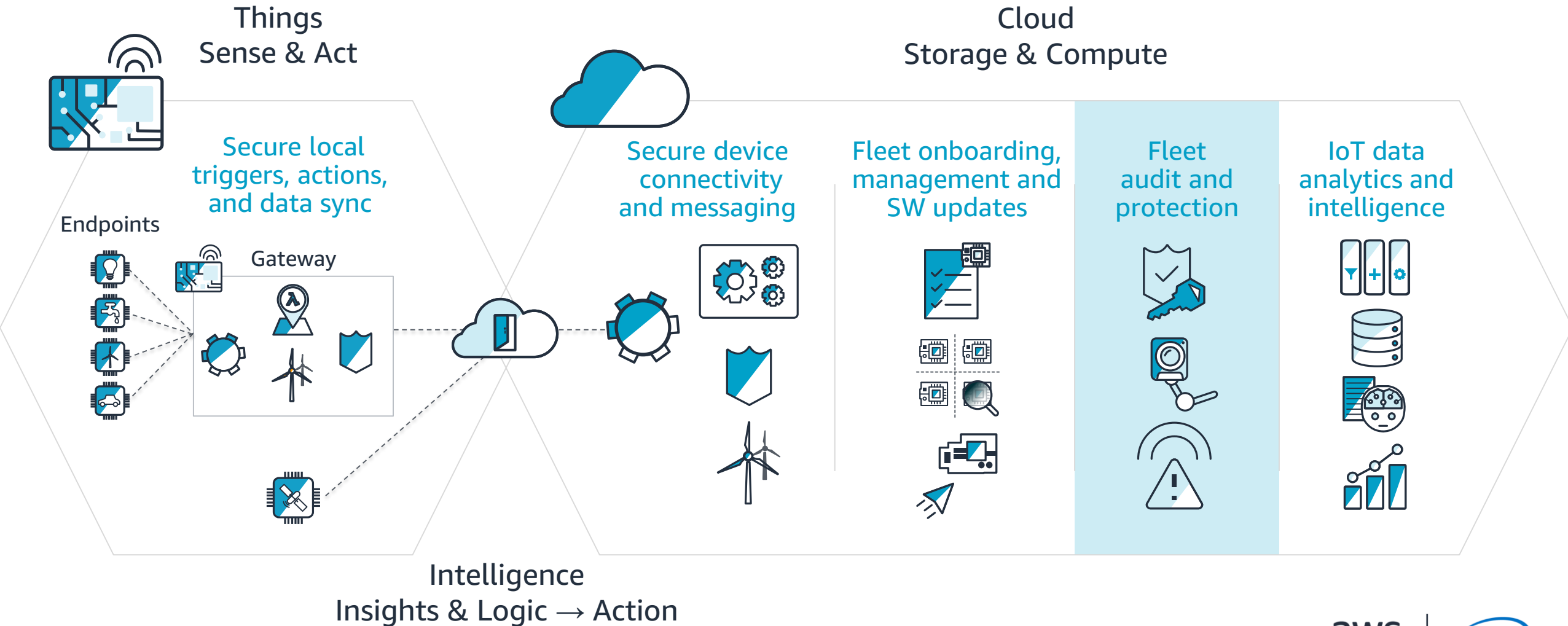
**“My system
DOES NOT NEED
security.”**

***"My system
DOES NOT NEED
security"***

**“Security at this
level is
TOO EXPENSIVE.”**

***“Security at this
level is
TOO EXPENSIVE.”***

AWS IoT Architecture





AWS IoT Device Defender

COMING
IN 2018

Keep Your Fleet Secure



Audit Device
Configurations



Monitor Device
Behavior



Identify
Anomalies



Generate
Alerts



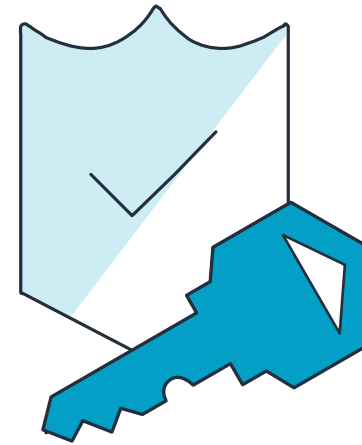
Patch Security
Vulnerabilities

Audit Device Configurations

- Ad-hoc and/or scheduled device security policy auditing against best practices

Monitor Device Behavior

- Monitors incoming security metrics and data from connected devices
- Create your own device profile for expected device behavior such as which IP addresses the device can communicate with
- Compares device metrics against expected device behavior such as volume of messages permitted during a 24 hour period



scheduled



Ad-hoc

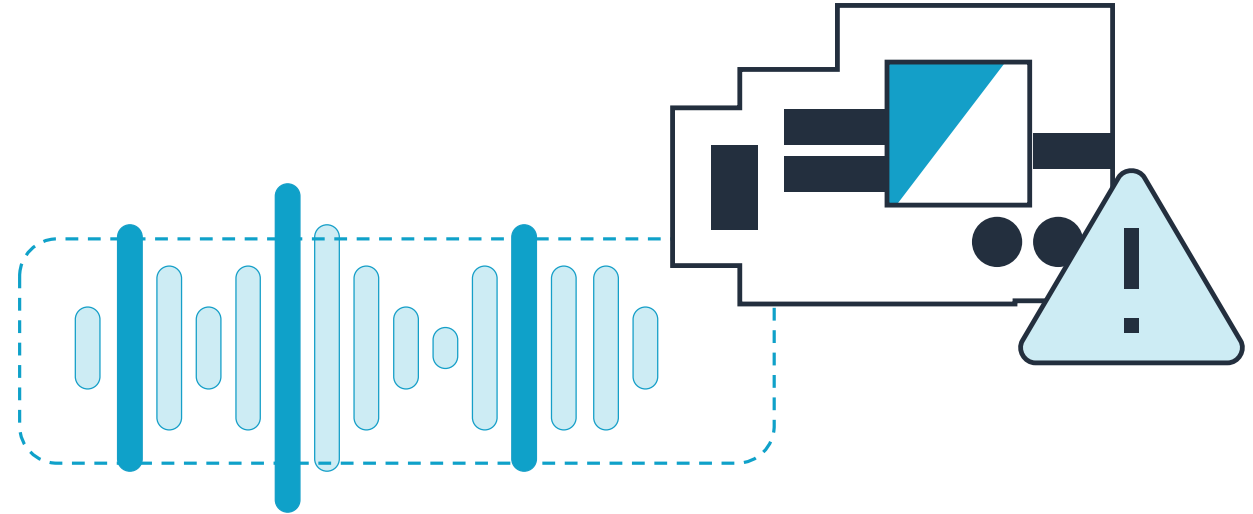
Identify Anomalies

Blacklist/Whitelist behaviors for:

- IP destinations and Geo locations
- Connection IPs
- Open ports

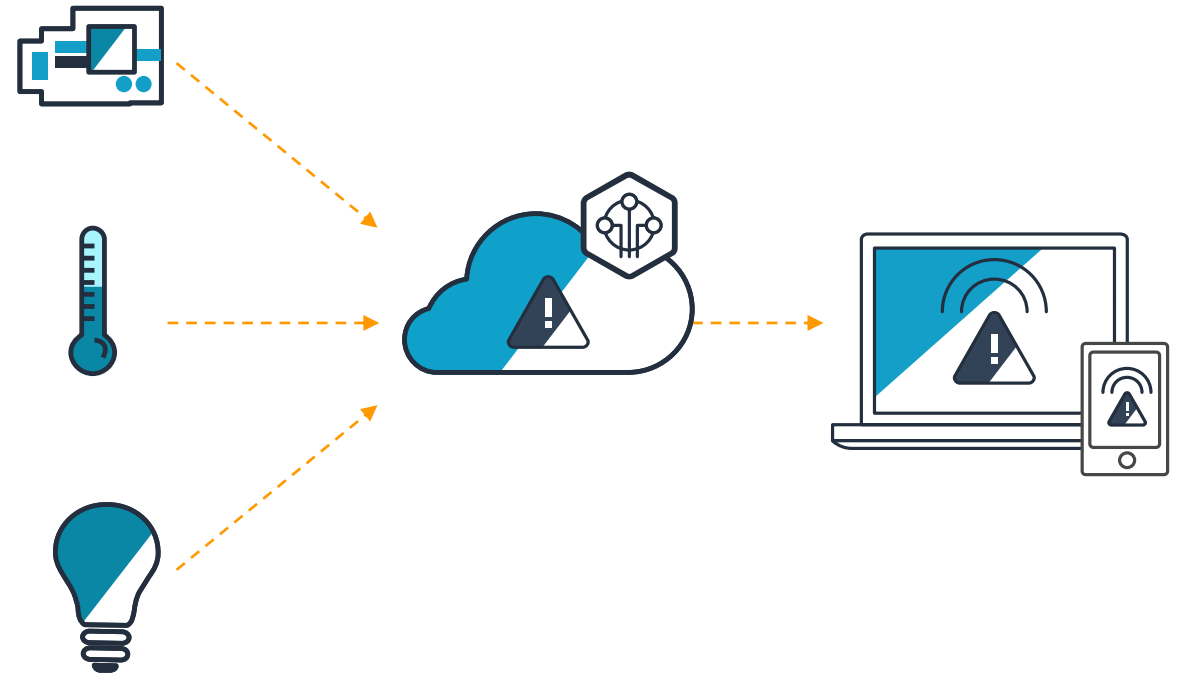
Define thresholds behavior for:

- Number of active connections
- Number of open ports
- Number of outbound packets across all protocols per unit of time
- Number of outbound bytes across all protocols per unit of time
- Number of authorization failures within 24 hours
- Message rate and Message size

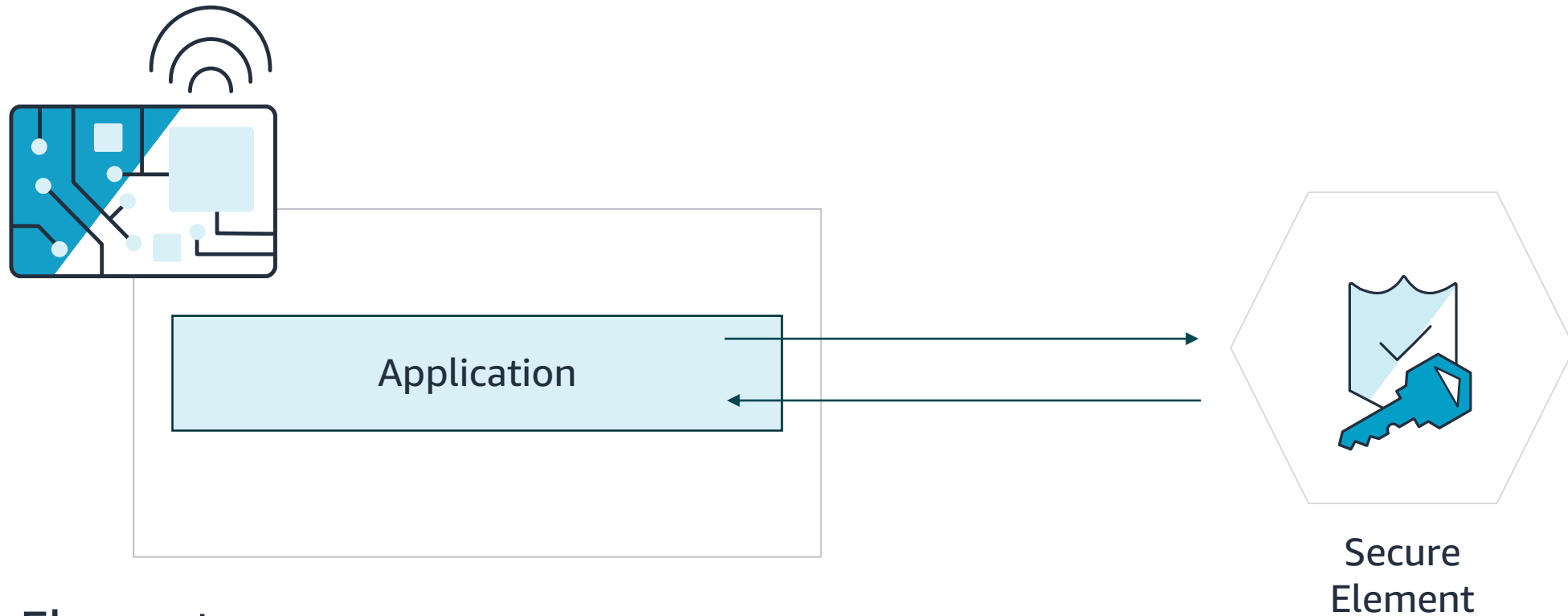


Generate Alerts

- Alerts generated based on identified anomalies and audits
- Alerts sent to AWS IoT Console, Amazon CloudWatch, and Amazon SNS
- Review historical and contextual information about your fleet when it fails an audit or when behavior deviates from what is expected
- View recommended actions to minimize the impact of security issues



Security at the device level



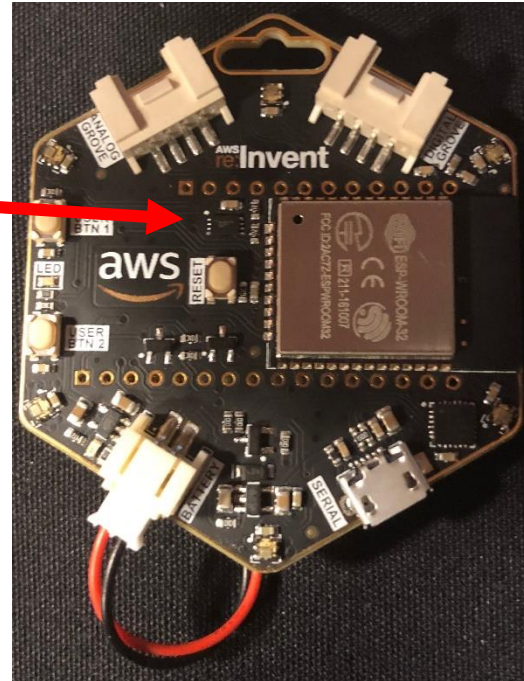
Secure Element:

- Perform cryptographic operations with the private key
- Private key cannot be extracted

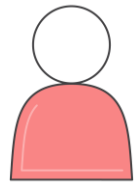
Example: Drink dispenser workshop

AWS Lanyard re:Invent board by Tekt

ECC508A

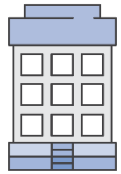


Manufacturing

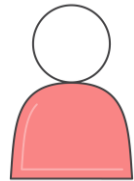


You

Manufacturing

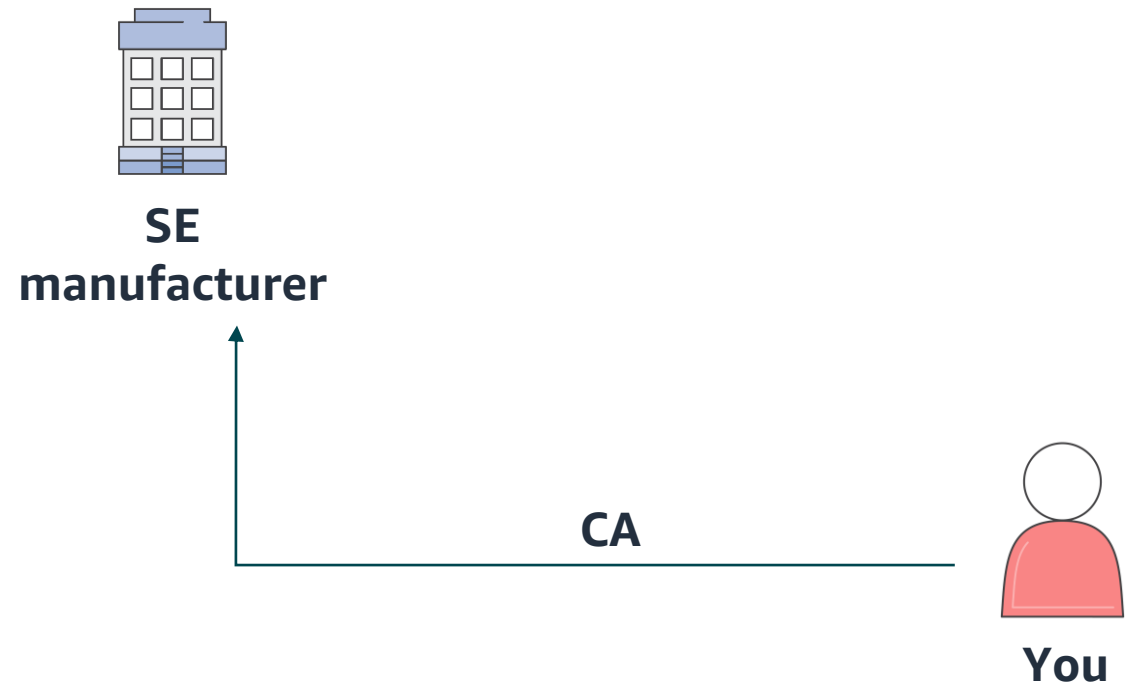


**SE
manufacturer**

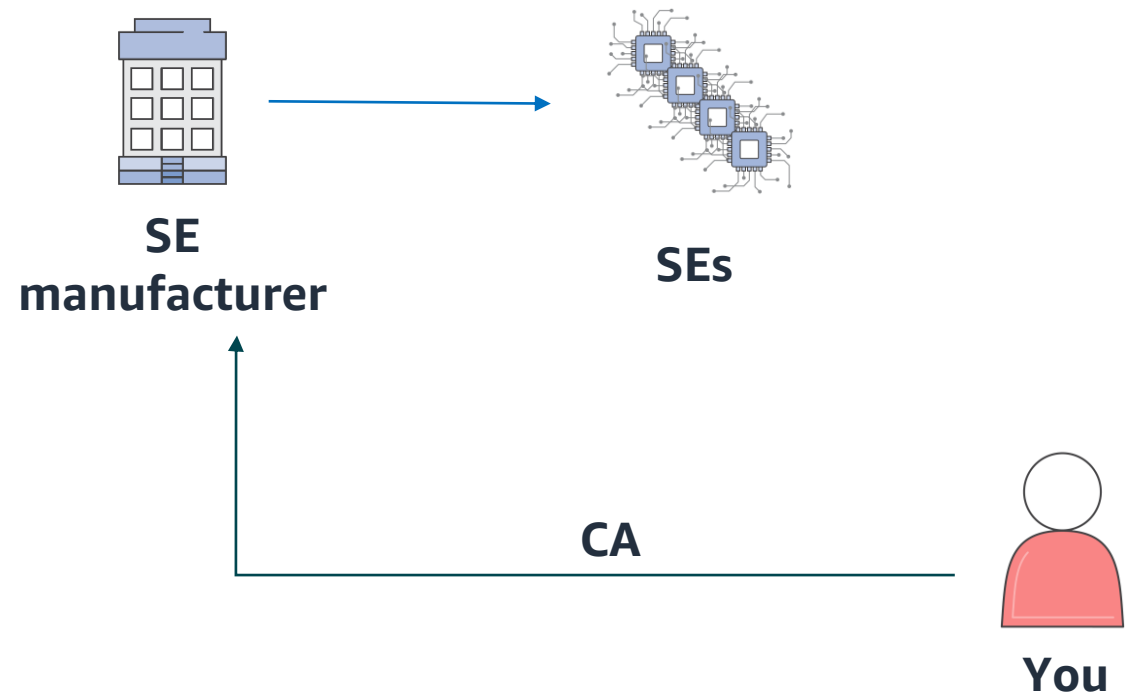


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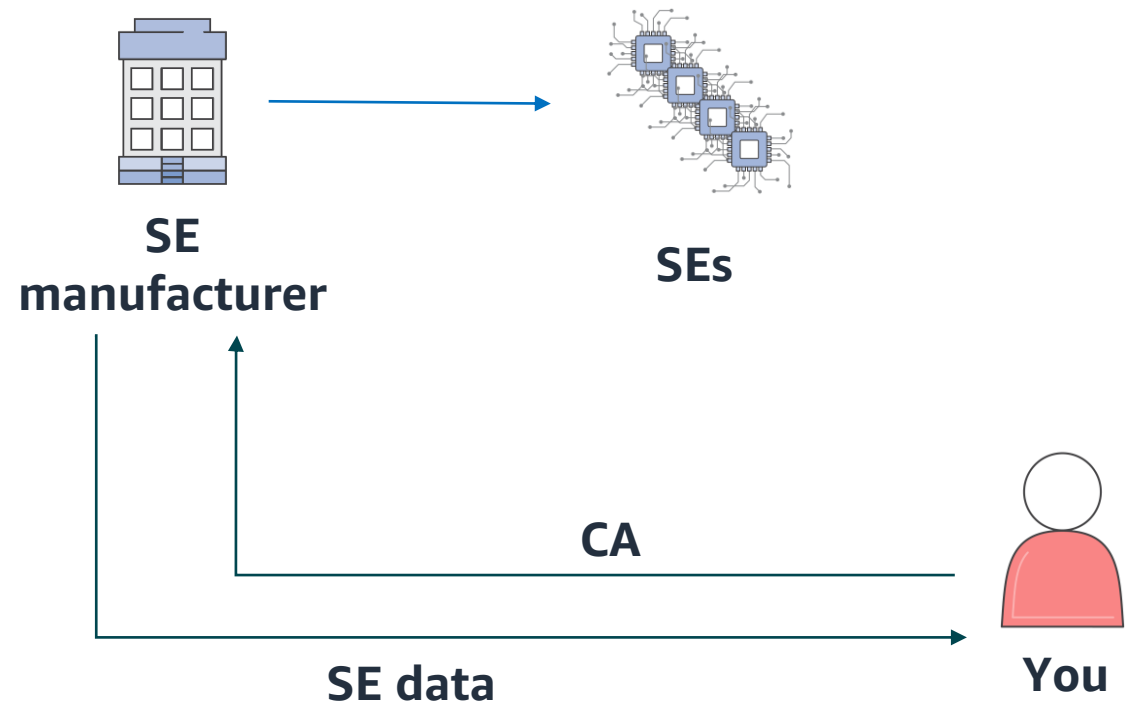
Manufacturing



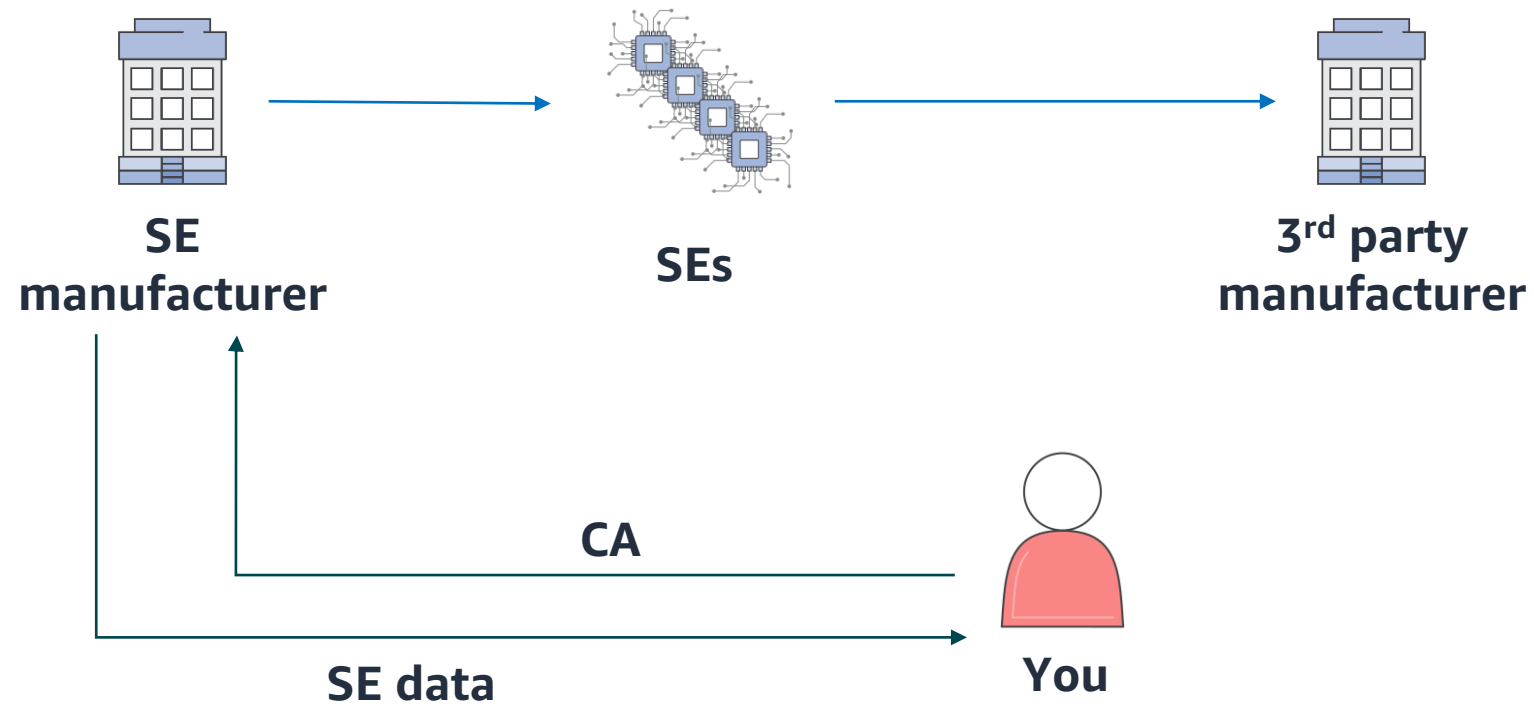
Manufacturing



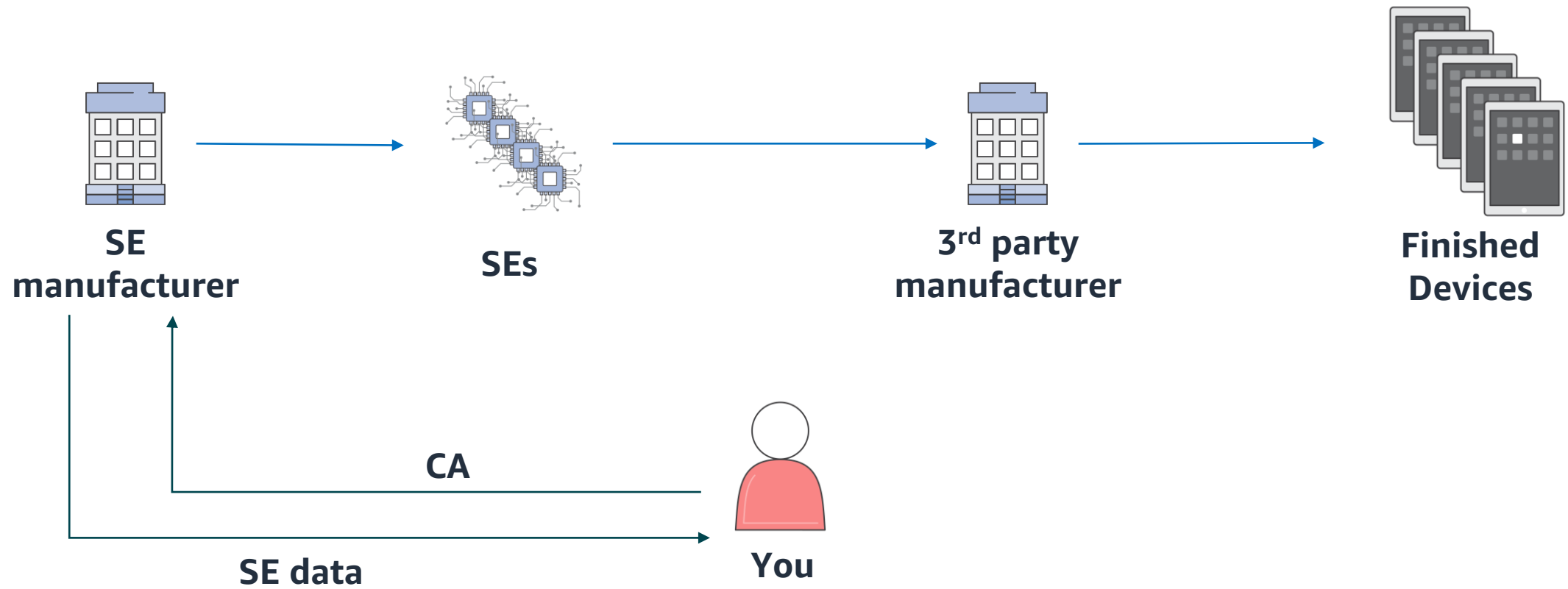
Manufacturing



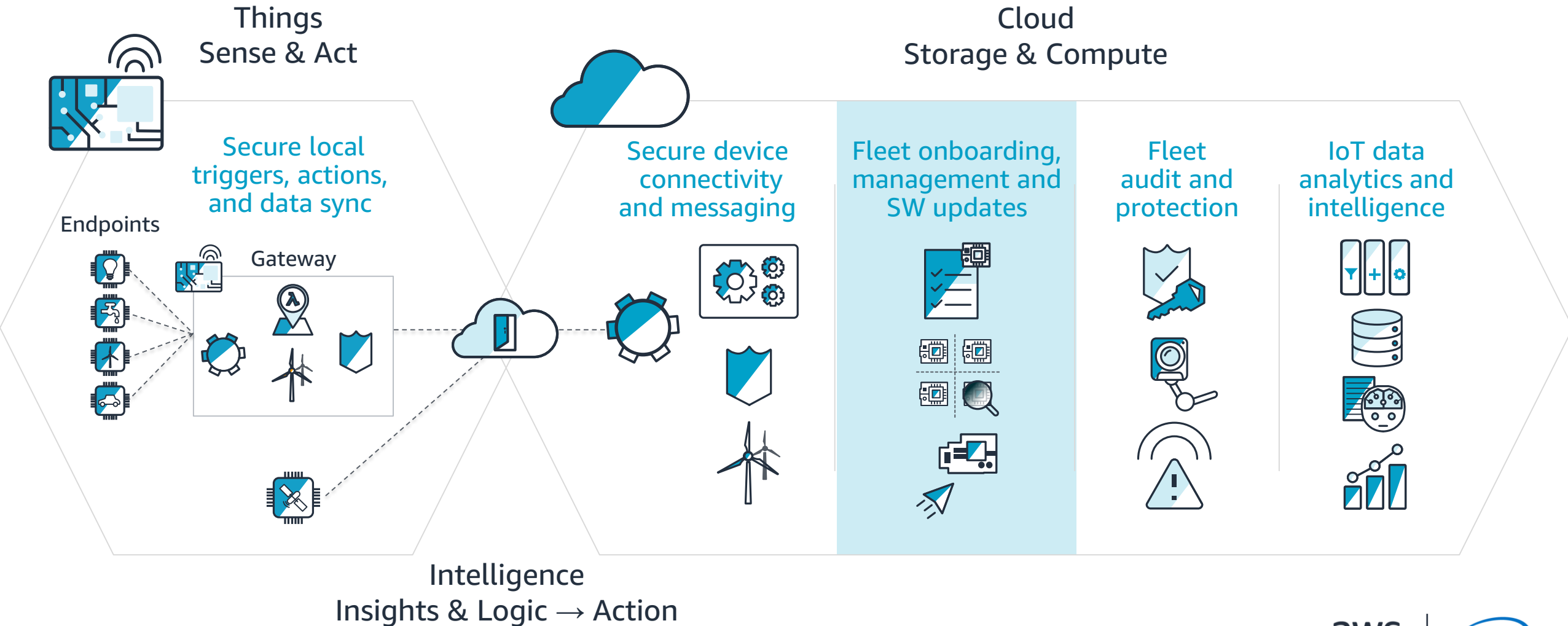
Manufacturing



Manufacturing



AWS IoT Architecture



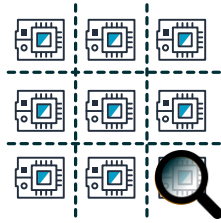


AWS IoT Device Management

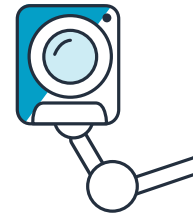
Maintain Fleet Health



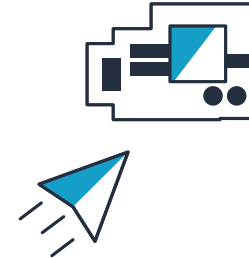
Batch Fleet
Provisioning



Real-time
Fleet Index & Search



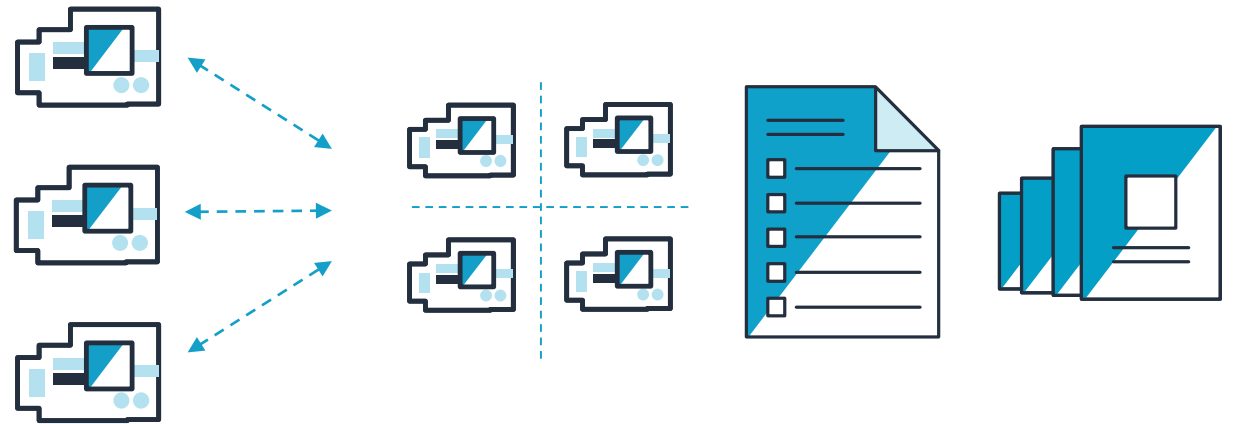
Fine Grained
Device Logging
& Monitoring



Over the
Air Updates

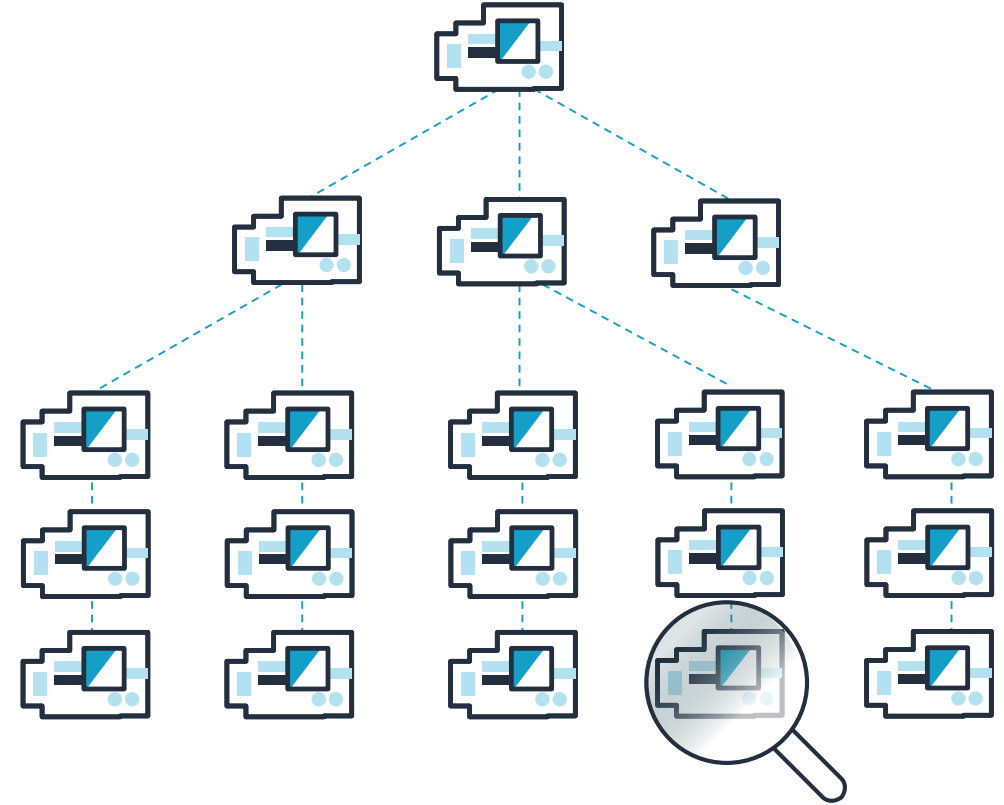
Batch Fleet Provisioning

- Provides provisioning workflows to register device information such as metadata, certificates, and policies for the entire fleet
- JSON template with parameters to define IoT resources (things, certificates, policies) that represent device in the cloud.
- Upload via console or call `StartThingRegistrationTask` API for registering all devices in bulk
- Track provisioning progress, or download reports for completed tasks
- Can be used for provisioning new devices or re-registering devices (e.g. rotating certificates)



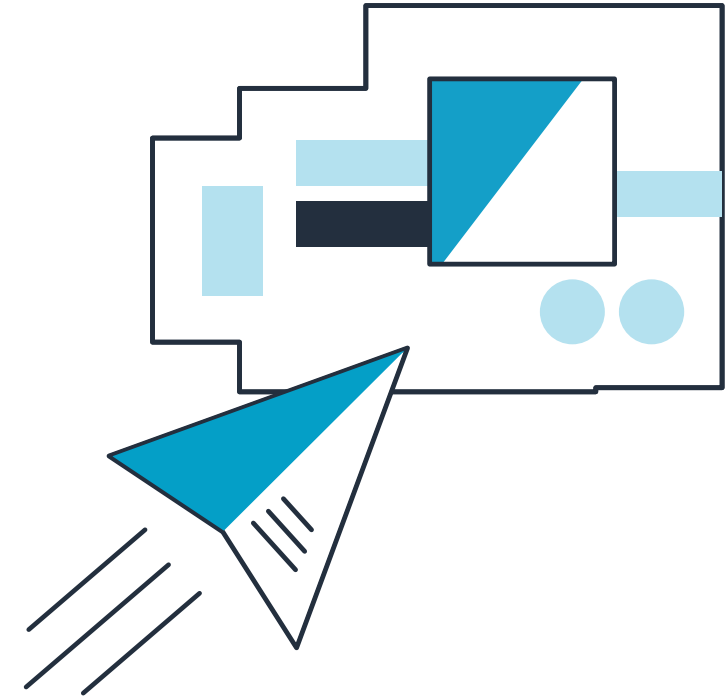
Real-time Fleet Index & Search

- Fast querying across different data sources for your entire device fleet in near real-time
- Currently maintains an index of two data sources (Registry and Shadow) which will allow you to find devices within the fleet based on any combination of device attributes and states
 - “Find all devices manufactured after 2013 with firmware version 1.2 that are connected to a charging station”
- Easy to use – one-click activation via console.
- Support for additional sources (connections, errors, custom data sources) in Q2/2018



Over the Air Updates

- Push over the air updates to your devices after they're deployed to the field to improve device functionality
- Receive notifications on the status of each device update to monitor your updates as they execute
- Target groups of devices to update in bulk, or pinpoint single devices to update
- Control your deployment velocity to reduce the blast radius of any update



Onboarding of devices at scale strategies

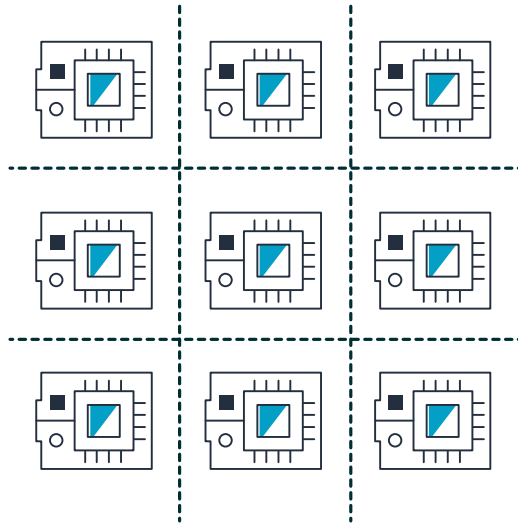
Examples:

- Pre Registration
- Just In Time Provisioning
- Just in Time Registration
- Certificate Vending Machine

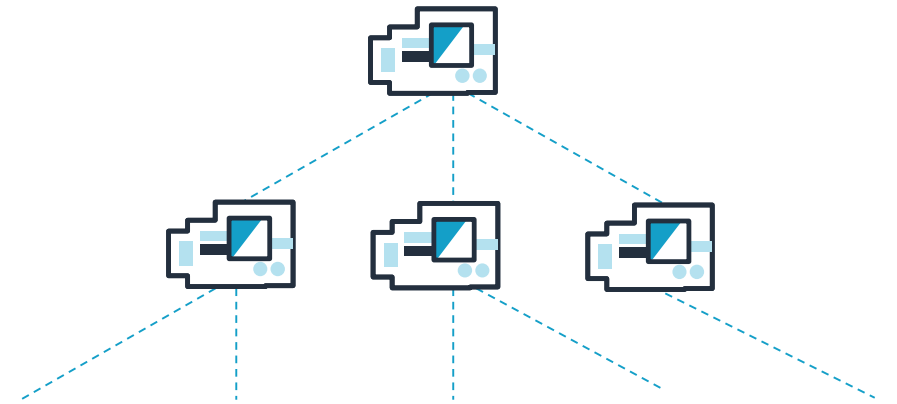
Onboarding of devices at scale: Pre-Registration



JSON description



Provision via
AWS IoT Device Management



Organized and ready to connect

Onboarding of devices at scale: JITP



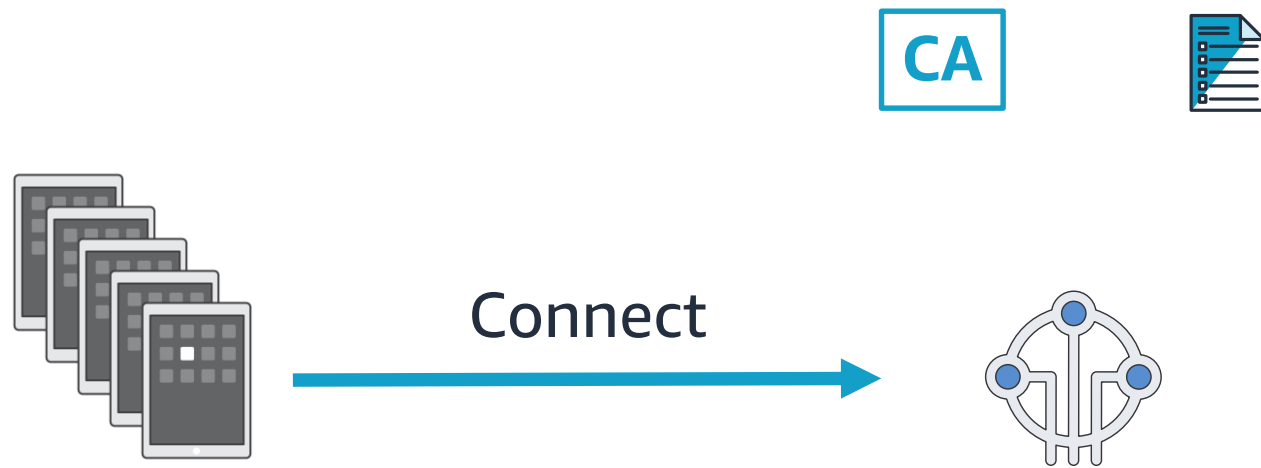
Onboarding of devices at scale: JITP



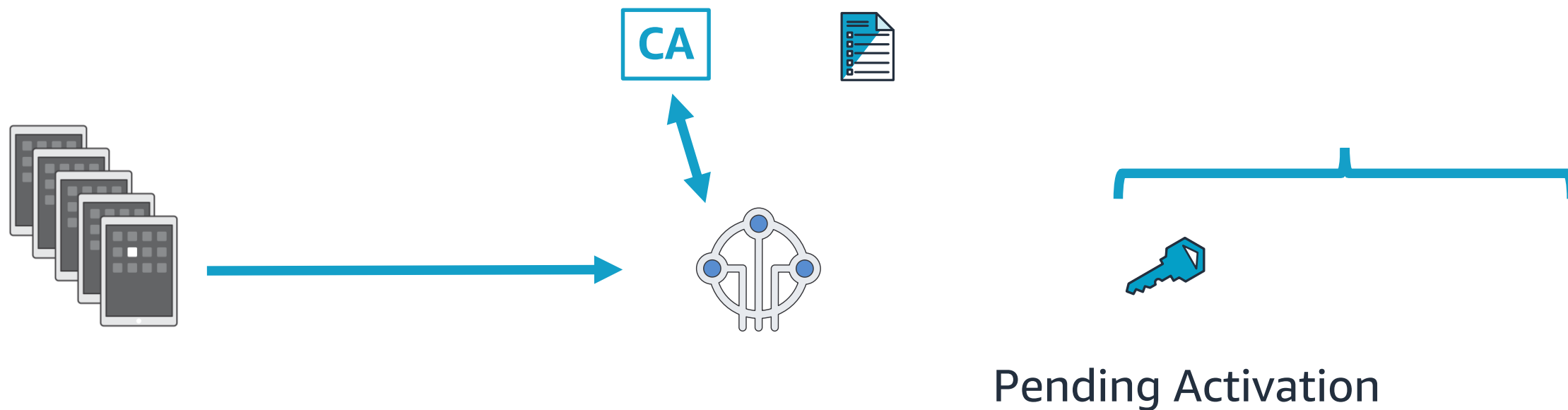
YOU

Register your CA, incl.
registration template

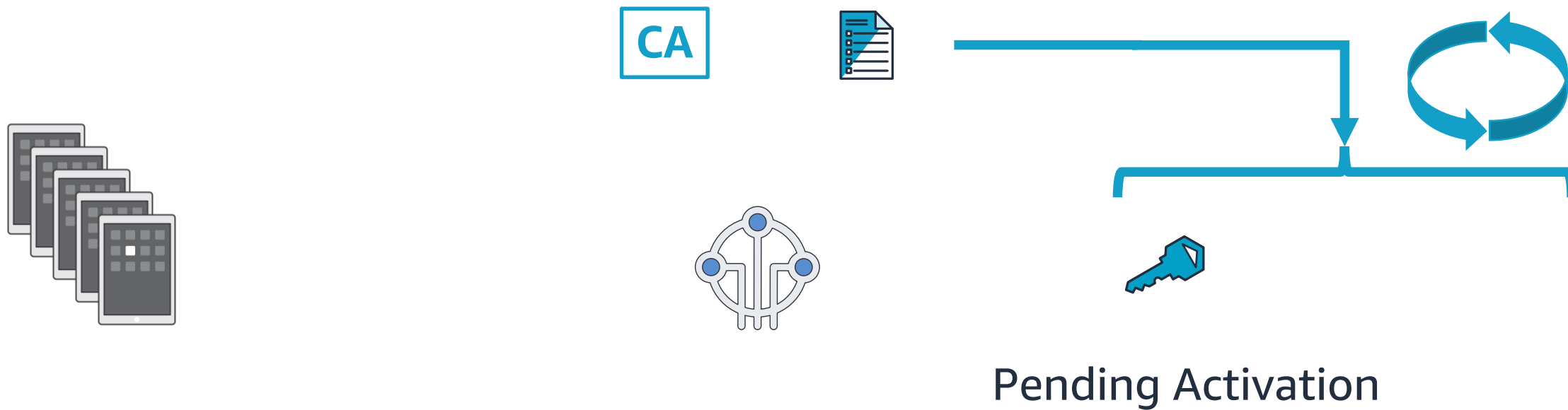
Onboarding of devices at scale: JITP



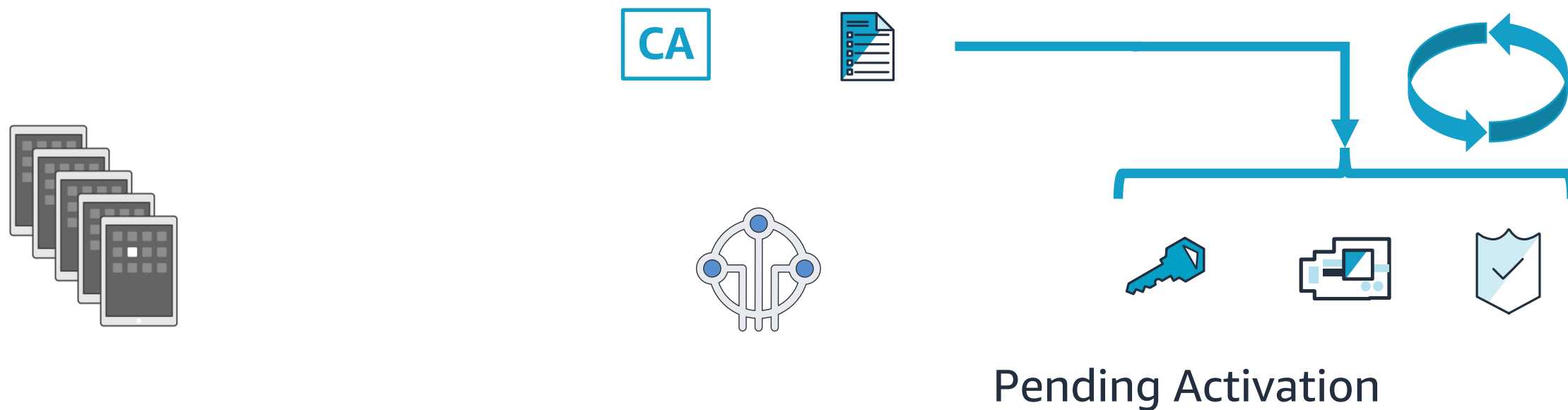
Onboarding of devices at scale: JITP



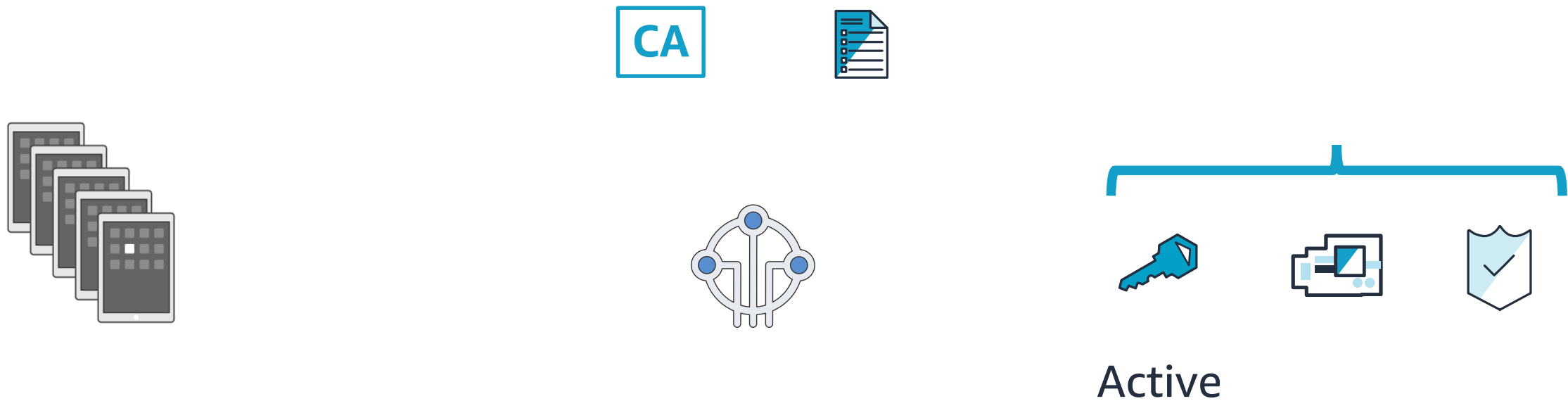
Onboarding of devices at scale: JITP



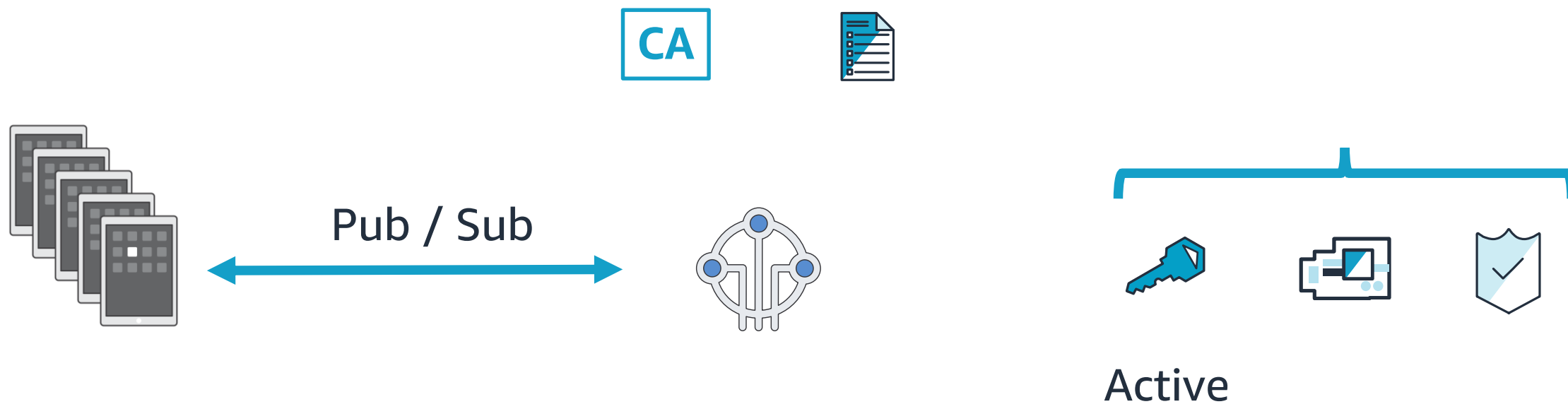
Onboarding of devices at scale: JITP



Onboarding of devices at scale: JITP



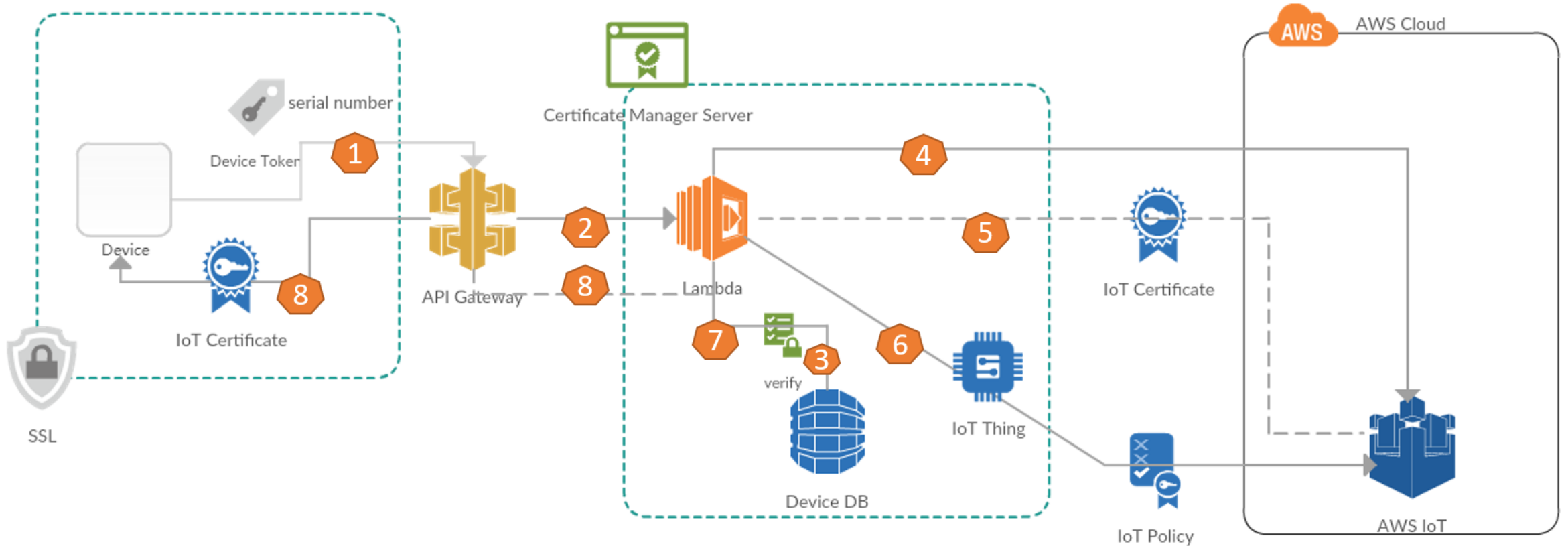
Onboarding of devices at scale: JITP



Onboarding of devices at scale: JITR

- Register your CA
- Devices connect
- Certificate in Pending Activation state
- Lifecycle events get triggered
- User defined Lambda function for creating: Thing, Certificate, Policy
- Certificate in Active state

Onboarding of devices at scale: Example: CVM



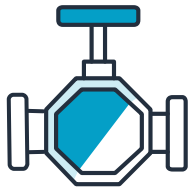
<https://github.com/aws-labs/aws-iot-certificate-vending-machine>

DATA

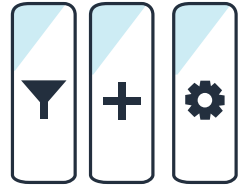
AWS IoT Analytics

Easily analyze IoT data

AWS IoT Analytics is a service that processes, enriches, stores, analyzes, and visualizes IoT data for manufacturers and enterprises.



Channels



Pipelines



Data Stores



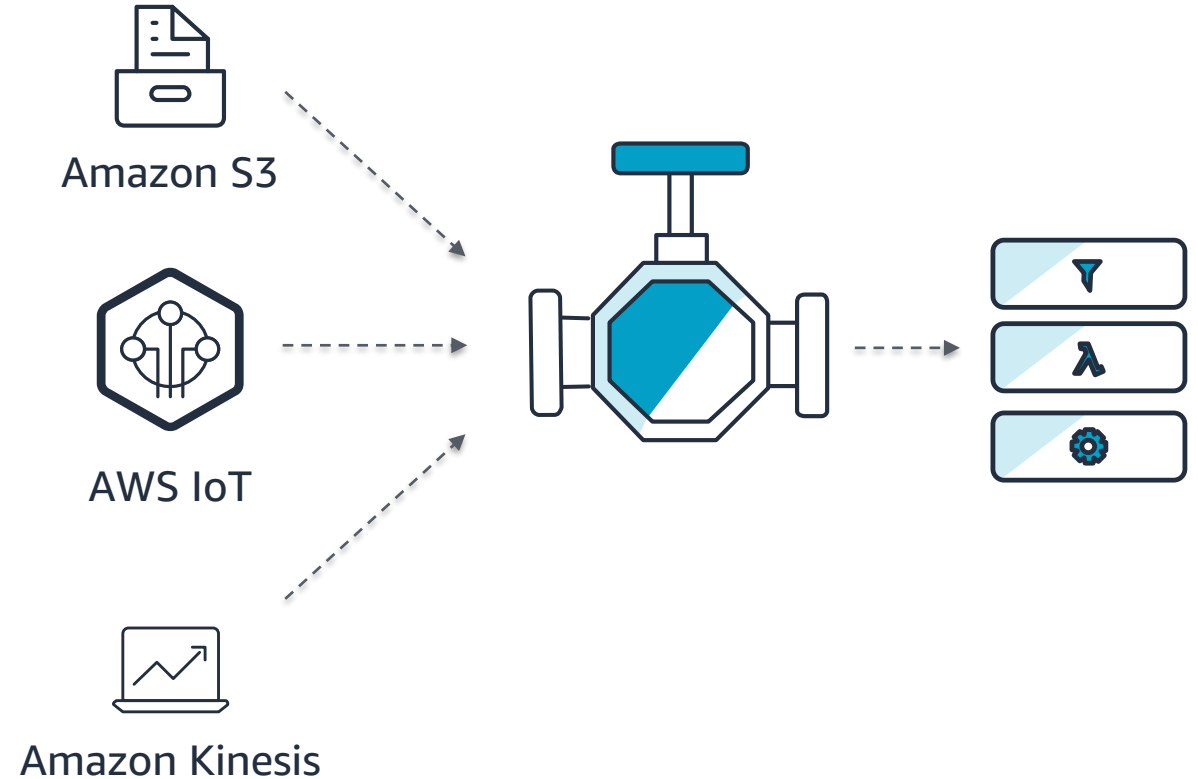
Datasets



Jupyter Notebooks
& Templates

Channels

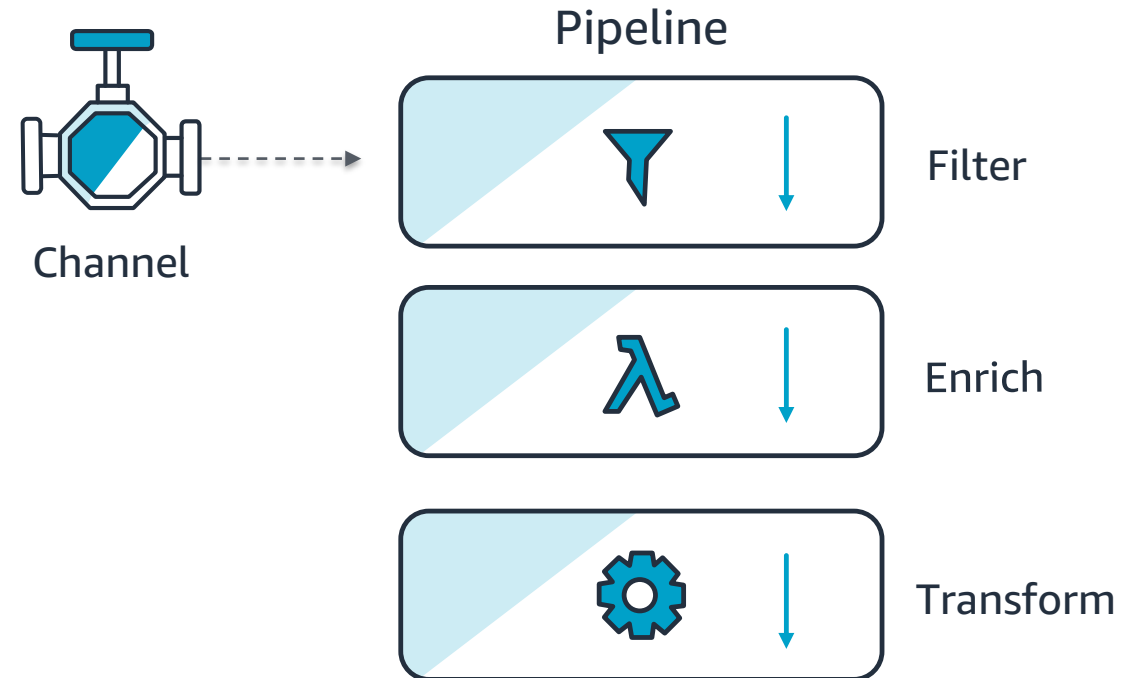
- Entry point to AWS IoT Analytics
- IoT Data Collection from Multiple Sources: IoT Core, Amazon Kinesis, S3, or custom source through APIs
- Data format agnostic
Binary, JSON
- Elastically scalable



Pipelines

Data (Pre)Processing and Enrichment

- **Filter messages**
Conditionally purge messages to remove outliers and erroneous/irrelevant data
- **Transform Messages**
Mathematical and conditional transformations to convert data (e.g. Celsius to Fahrenheit)
- **Enrich Messages**
Enrichment from MQTT Topic, Device Registry & Device Shadow
- **Custom Preprocessing**
Customer-defined lambda to add vital context to IoT data (e.g. geo location, weather data)
- Batches messages prior to enrichment ensures scalability
- Easily replicate pipelines using simple API structure as fleets grow from tens to thousands of devices



Data Stores

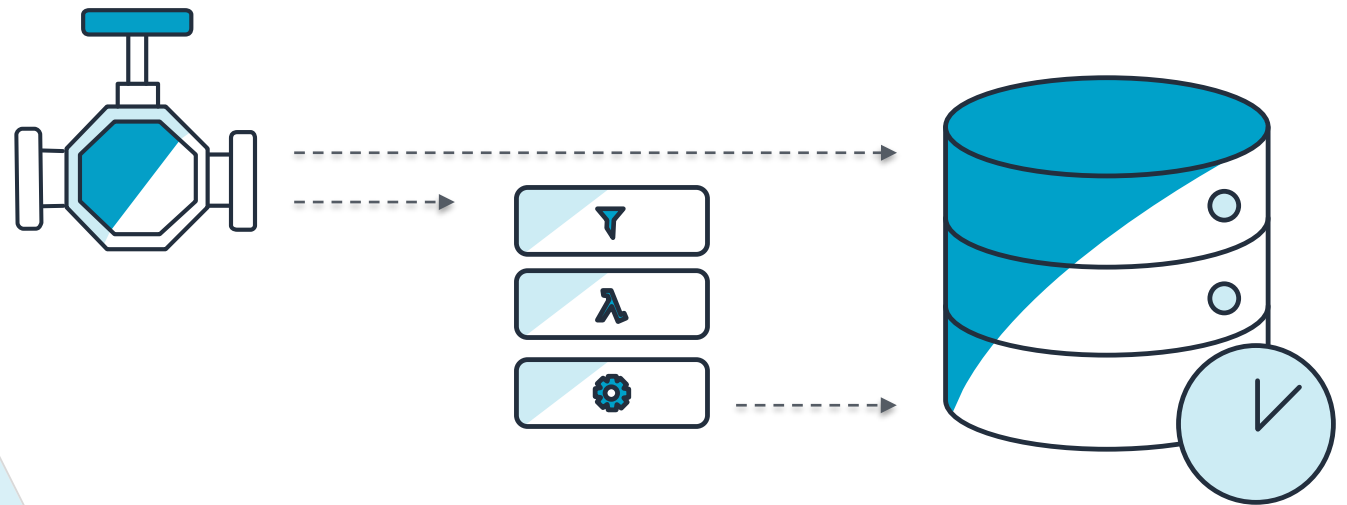
Raw and Processed Data Storage

Authoritative store of raw data from multiple devices.

- Immutably stores raw device data for easily reprocessing using different logic if your needs change

Fully managed and optimized processed data store for time series and IoT workloads

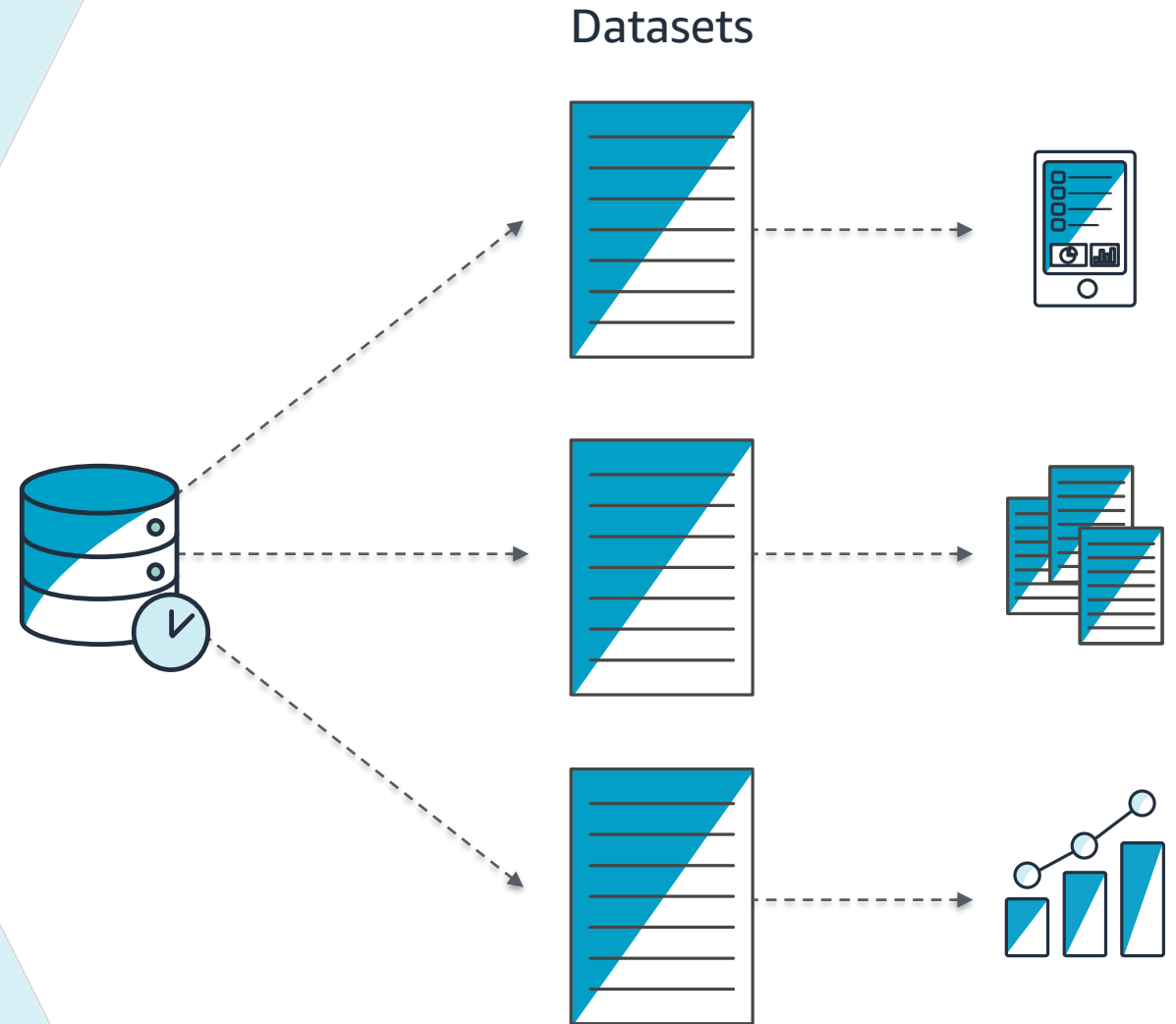
- Partitioned by time
Supports faster query response on time series data
- More than a single database
Abstraction on top of several database technologies in a single interface
- Manageable data retention policies



Datasets

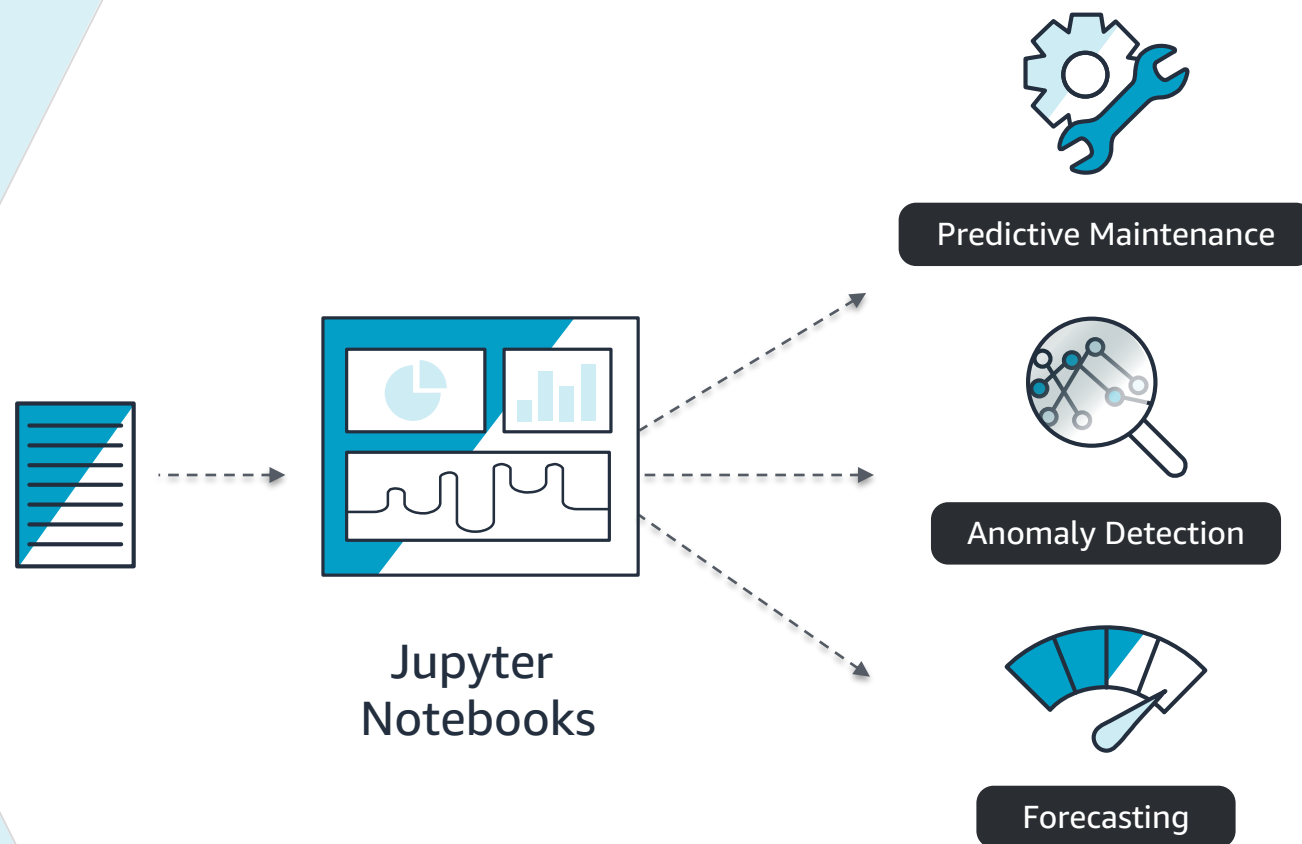
Queries on Data Store

- Query IoT Analytics Data Stores using standard SQL
- Queries can be run ad hoc, or scheduled
- Popular tabular format
- Visualize in QuickSight dashboards
Native QuickSight Connector to easily build metrics or inspect datasets
- Available via API, console download, or within Jupyter Notebooks
- Console Query Editor
Edit and schedule your queries from console



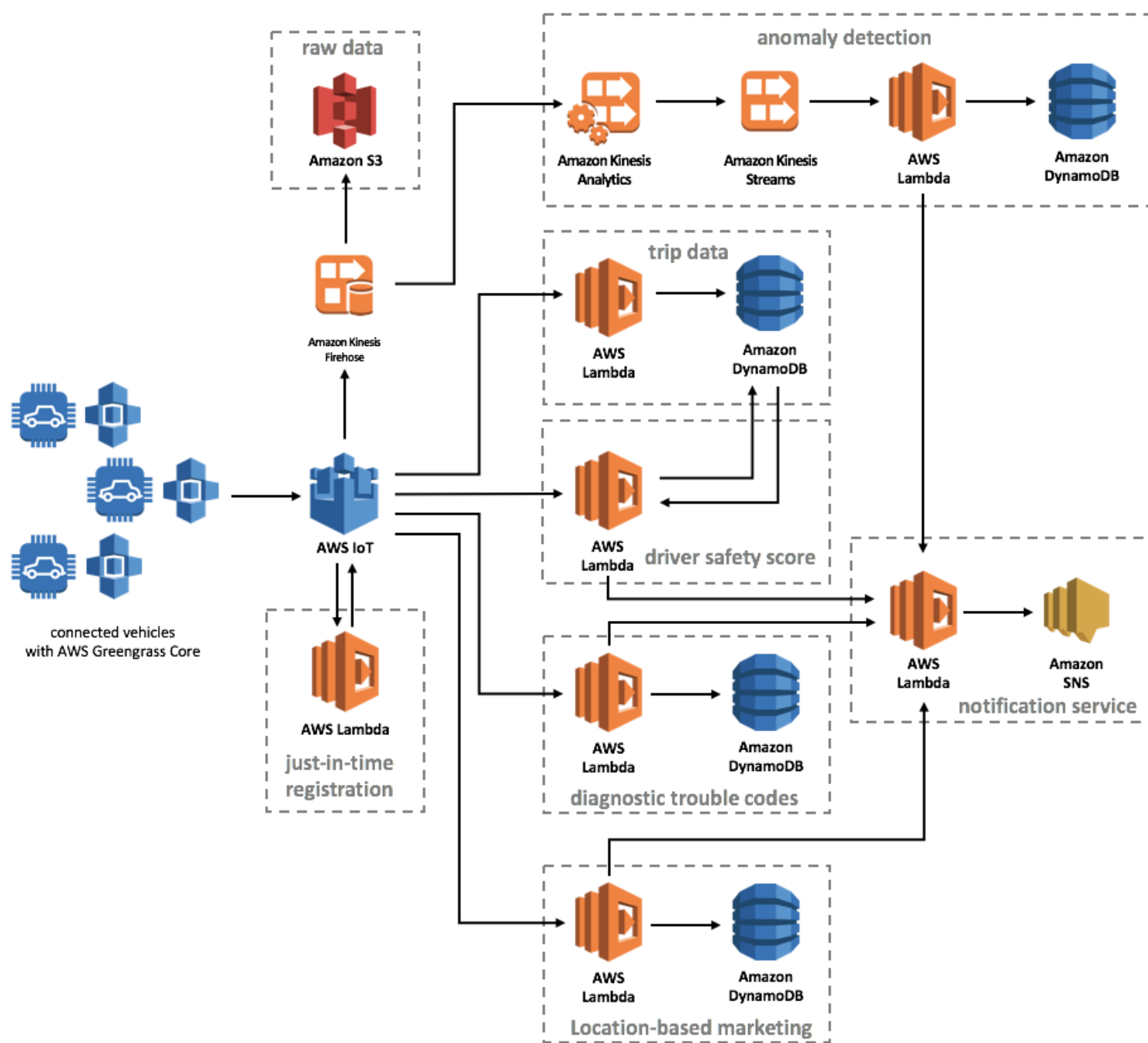
Jupyter Notebooks & Templates

- **Custom author Jupyter-based machine learning notebooks**
Allows you to build sophisticated ML models on IoT data using popular libraries such as Sci-Kit-Learn and TensorFlow.
- **Built in ML Notebook Templates**
Get started faster with pre-built notebook templates for common IoT use cases:
 - Predictive Maintenance
 - Anomaly Detection
 - Fleet Segmentation
 - Forecasting
- **Integrated with Amazon SageMaker**
Use your SageMaker Notebook Instances to run notebooks

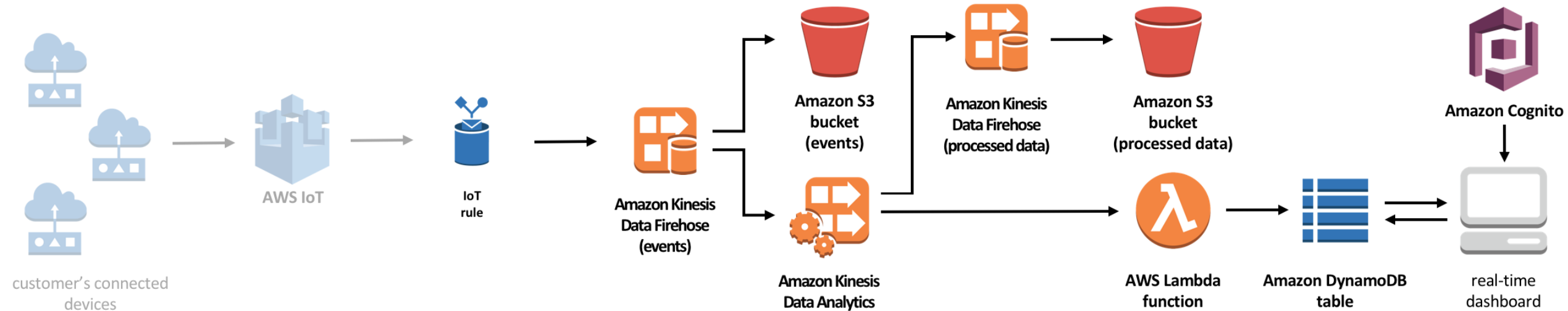


Example Solutions by AWS

AWS Connected Vehicle Solution



Real-Time IoT Device Monitoring with Kinesis Data Analytics



<https://aws.amazon.com/answers/iot/real-time-iot-device-monitoring-with-kinesis/>

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