AWS re:Invent

IOT214

What's new with AWS IoT Device Software?

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Agenda

Overview of AWS IoT device software

Gaining value from autonomous systems

- The value of an **open** ecosystem
- The value of a **secure** ecosystem
- The value of **data-driven** capabilities

Demo

Wrap-up

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

what **problems** would you solve?

AWS IoT customers solve problems in all sectors



AWS IoT architecture



How do I extract value from my IoT data?

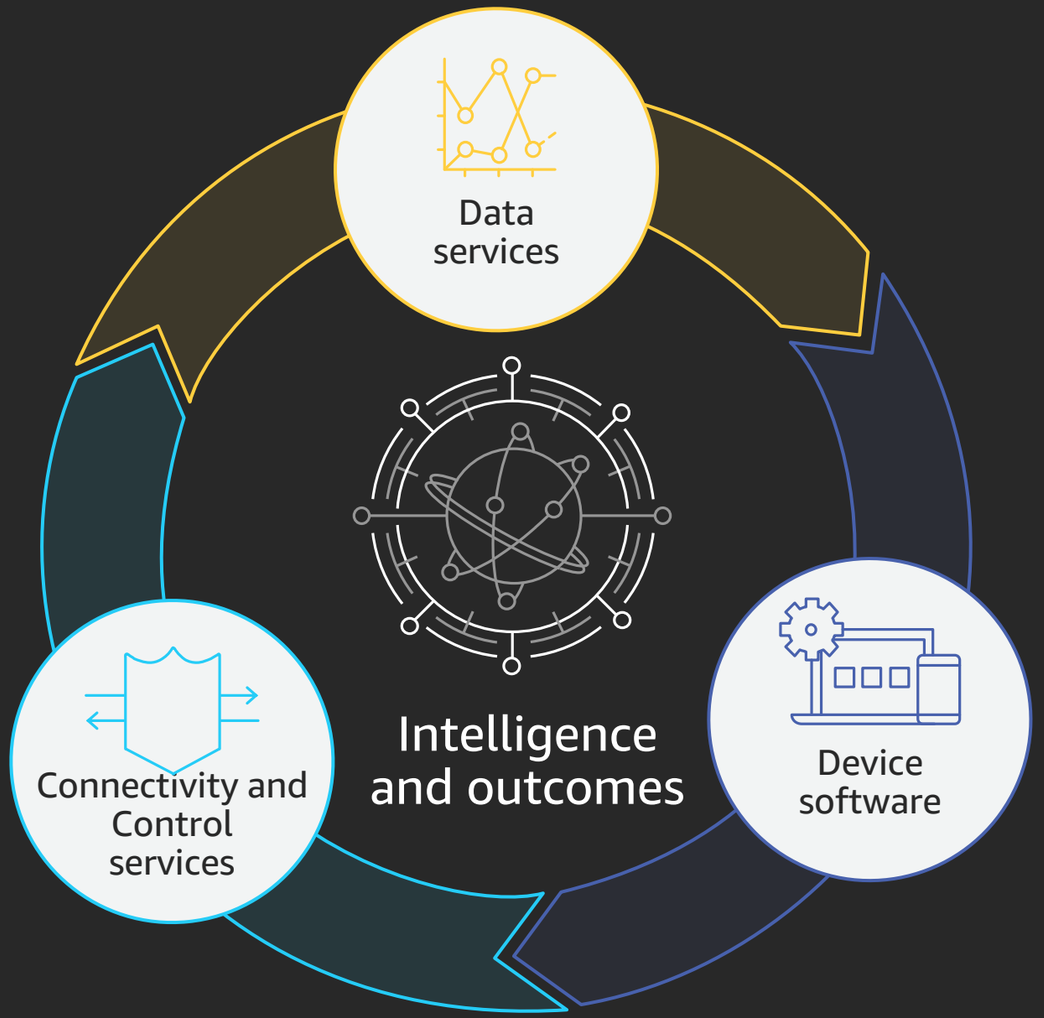


How can I control, manage, and secure my devices?



How can I build devices that operate at the edge?

IoT virtuous cycle



How can I securely connect my microcontroller-based devices to the cloud?



Device software



FreeRTOS



Local Connectivity Libraries

Communicate using local protocols like Wi-Fi and BLE, and with AWS IoT Greengrass devices

Cloud Connectivity Libraries

Easily collect data and take actions on microcontroller-based devices

Security Libraries

Secure device data and connections

OTA & Code Signing

Deploy security updates, bug fixes, and firmware updates to devices in the field

Device software

How do you reduce the cost of a virtual assistant?



iDevices®

Problem

iDevices was looking to expand their smart home portfolio to include a product with onboard voice services. In-house engineers and designers developed Instinct™, a smart light switch with Alexa built-in. With the backend infrastructure and industrial design complete, the team needed to choose a cloud-based platform to execute and analyze IoT features.

Solution

Devices utilized an Alexa Voice Service (AWS) certified hardware development kit, enabled by Amazon FreeRTOS, to connect to AWS IoT Core by default. AWS IoT Core serves as the cloud-based messaging protocol for Instinct's Amazon Alexa, light switch, night light, and motion sensing functionality. Instinct allows users to invisibly integrate the power of Amazon Alexa throughout their homes, and reap the benefits of whole-home voice control without sacrificing valuable counter space.

Impact

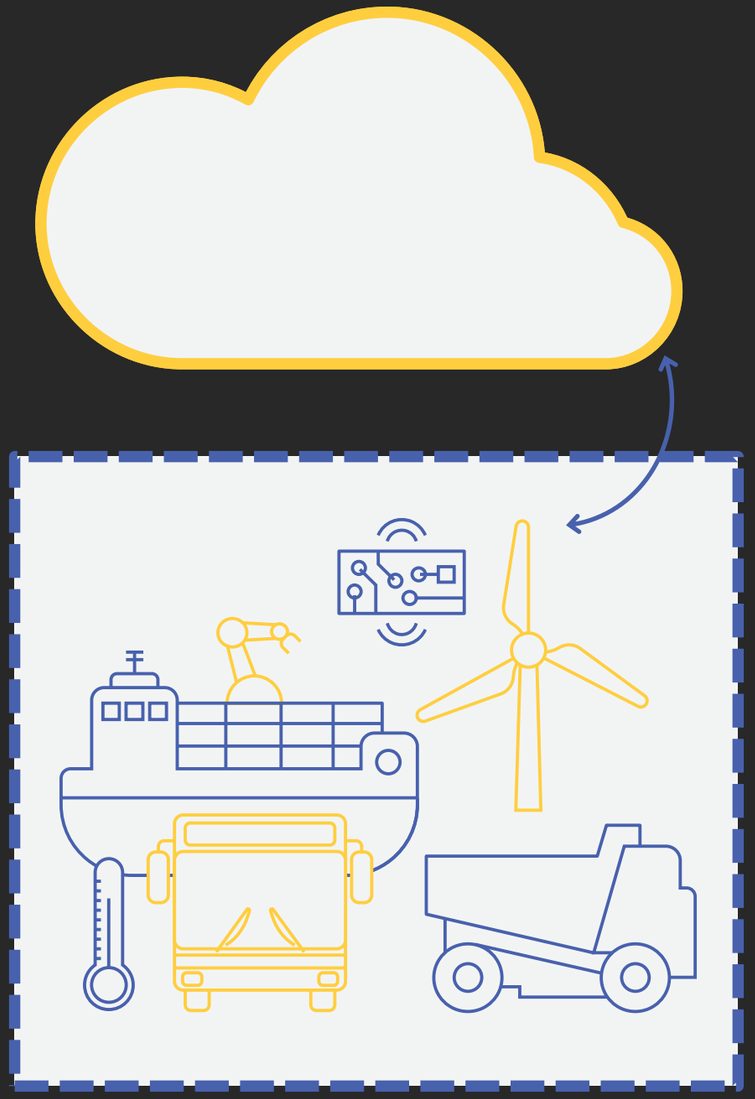
Instinct is the first of many innovations driven by the combination of iDevices' vast IoT expertise, and Hubbell's 130-plus years of electrical manufacturing and distribution experience. By employing AWS IoT services, iDevices was able to accelerate time-to-market and optimize infrastructure costs.



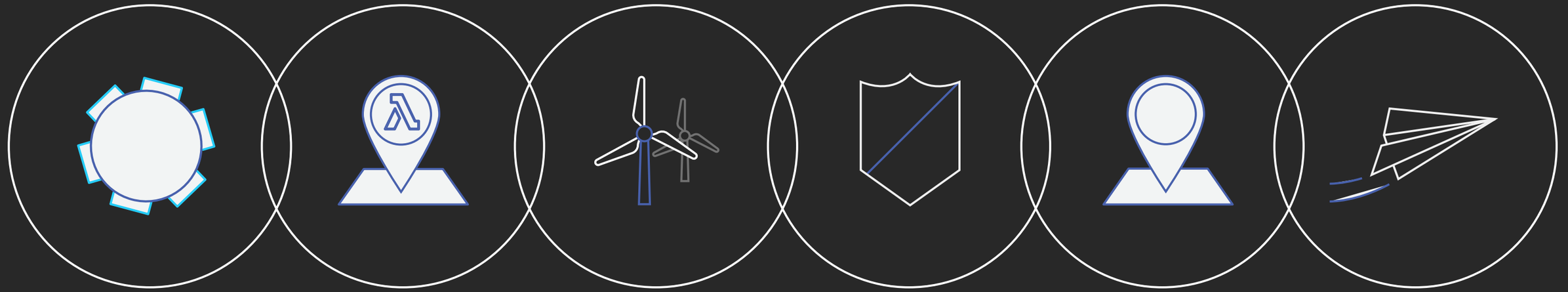
How can I extend AWS cloud capabilities to the edge?



Device software



AWS IoT Greengrass' Foundational Components



Local Messages and Triggers

Enable device communication without a cloud connection

Local Actions

Simplify device programming with AWS Lambda

Data and State Sync

Operate devices offline & synchronize data when reconnected

Security

Mutual authentication & authorization between cloud and devices

Local Resource Access

AWS Lambda functions can access & use local resources of a given device

Over the Air Updates

Easily update AWS IoT Greengrass Core

How do you test a device across 50 countries?



Amazon Kindle

Problem

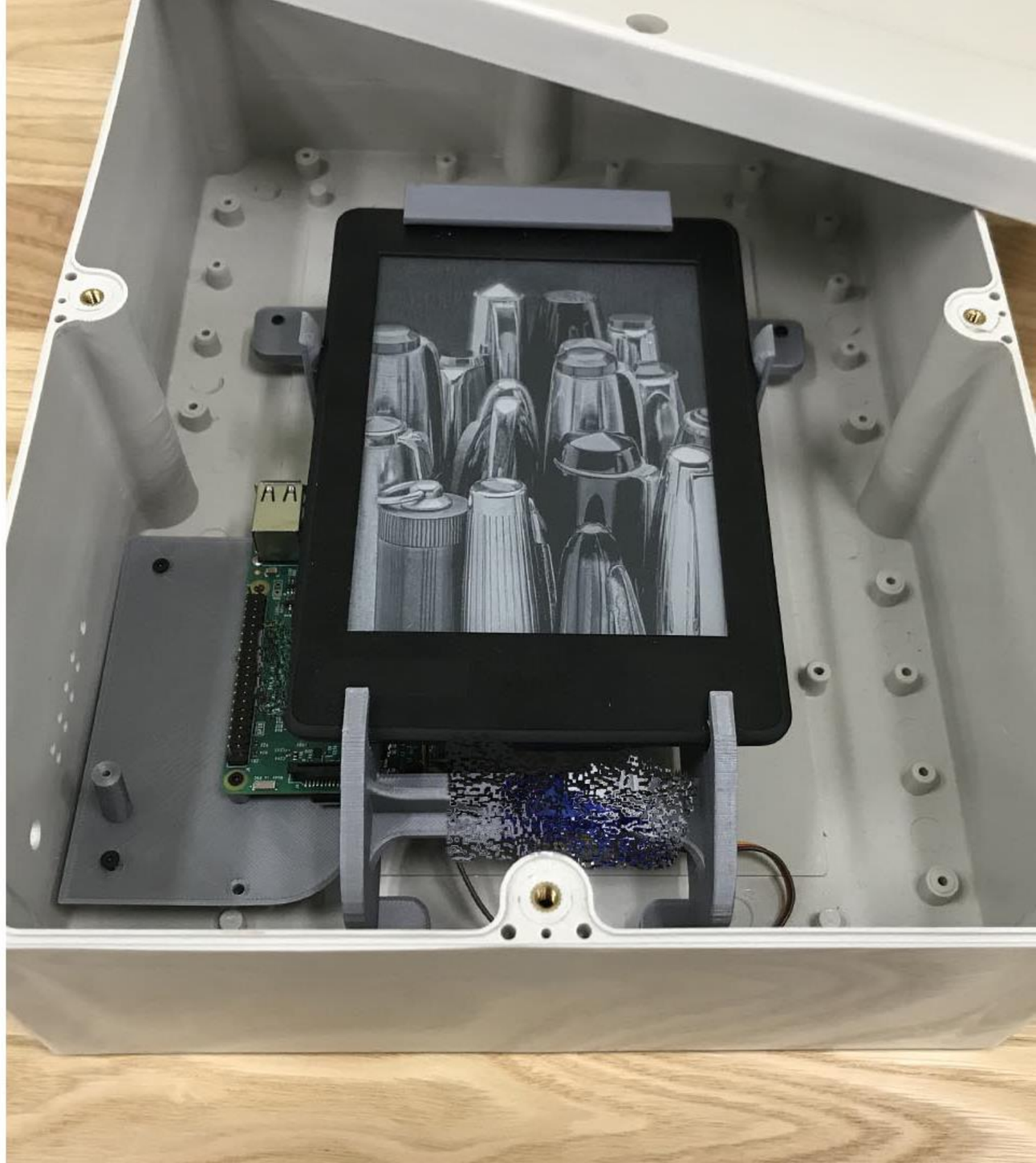
The Kindle team sent employees to each country where the team launched a product, as experience had shown that testing devices in each country uncovered edge cases not encountered in the lab. But sending individual employees does not scale well and makes it hard to centrally capture test results.

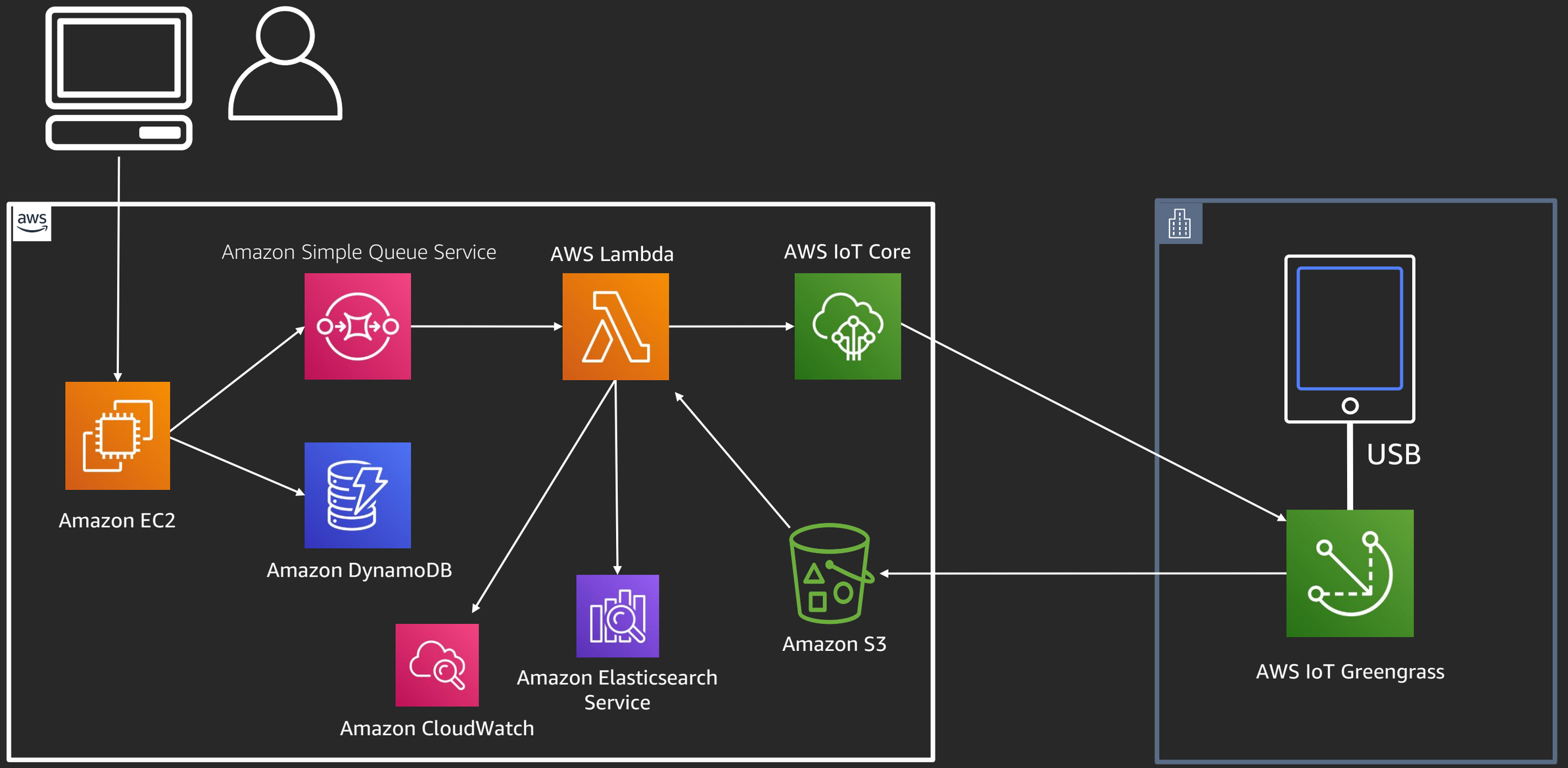
Solution

To reduce costs, and better scale, the team began building a device that could be shipped globally and enable them to remotely run tests, as well as allow for dynamic updates to the test suite. The team chose to use AWS IoT Greengrass and AWS IoT Core to ensure reliable execution of tests regardless of connectivity.

Impact

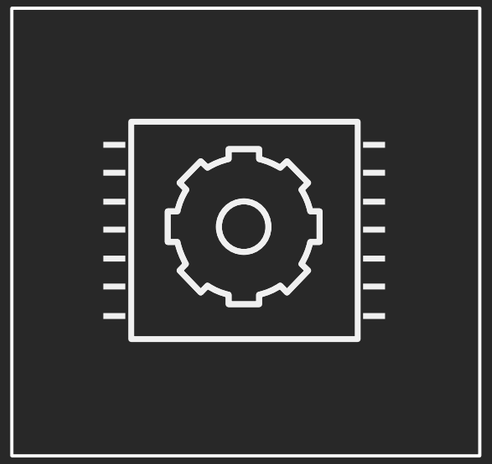
Kindle employees now create and deploy test jobs from continents away by simply writing AWS Lambda functions. The Kindle team reduced the costs associated with personnel travel, while enabling faster test iteration cycles. AWS IoT provides a seamless way to handle edge and cloud computing as well as ensure reliable device connectivity.



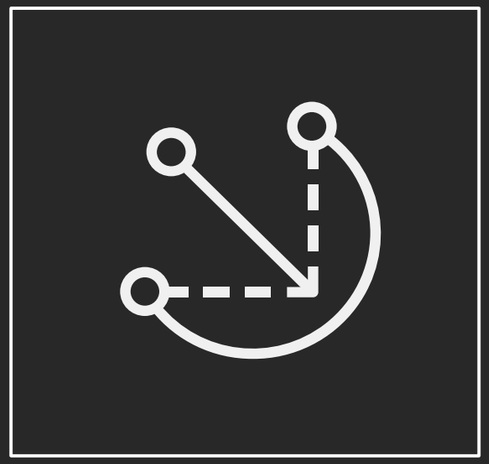

aws
Amazon Simple Queue Service
AWS Lambda
AWS IoT Core
Amazon EC2
Amazon DynamoDB
Amazon CloudWatch
Amazon Elasticsearch Service
Amazon S3
USB
AWS IoT Greengrass

AWS IoT Device Tester

AWS IoT Device Tester is a test automation tool that lets you test Amazon FreeRTOS or AWS IoT Greengrass on your choice of devices.



AWS IoT Device Tester for Amazon FreeRTOS
Tests if the Amazon FreeRTOS cloud connectivity, OTA, and security libraries function correctly on top of microcontroller board device drivers



AWS IoT Device Tester for AWS IoT Greengrass
Tests if the combination of device's CPU architecture, Linux kernel configuration, and drivers work with AWS IoT Greengrass



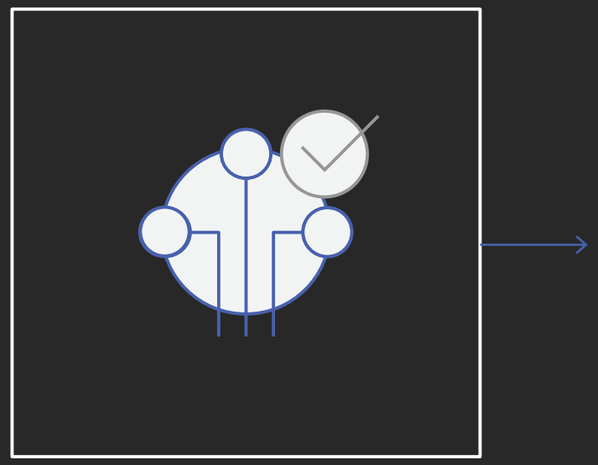
Device software

Download AWS IoT Device Tester

from AWS IoT Greengrass and Amazon FreeRTOS product pages

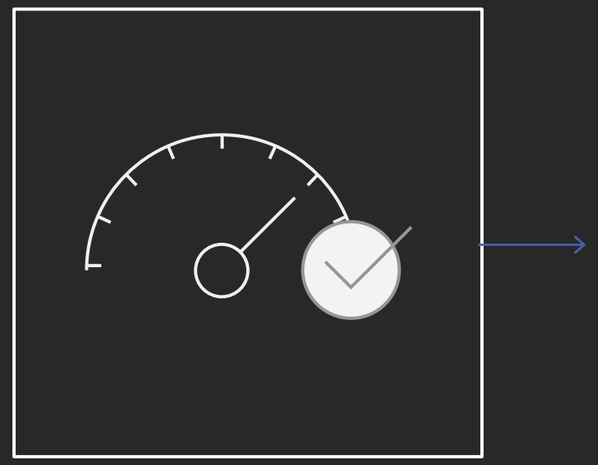
AWS IoT Device Tester

Gain Confidence



Authenticate and interoperate with AWS IoT services

Make Testing Easy



Sets up required cloud resources, automates compiling and flashing of test cases on the target device for execution

Get Listed



Submit AWS IoT Device Tester results to get listed in AWS Device Catalog*

*Available as part of the Device Qualification Program

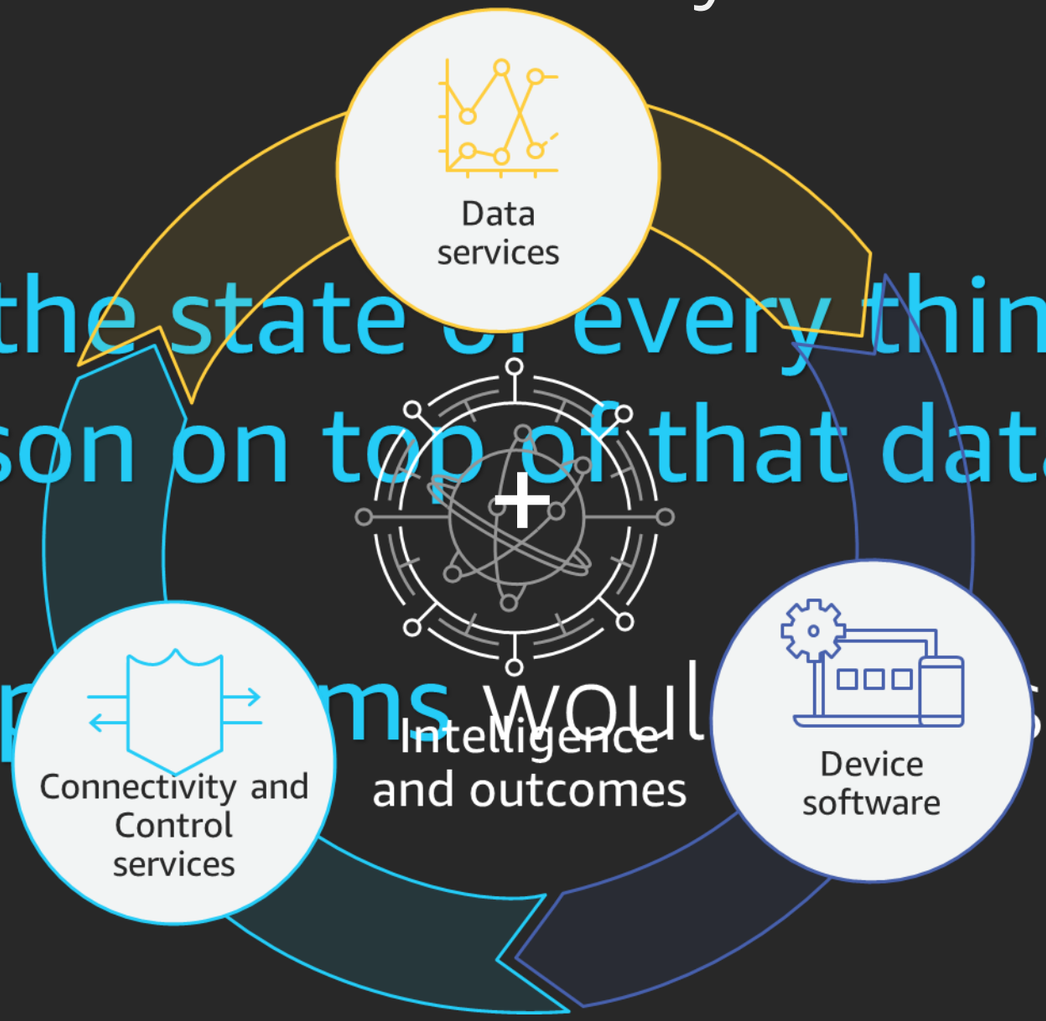


Device software

The Growing AWS IoT Edge Partner Community



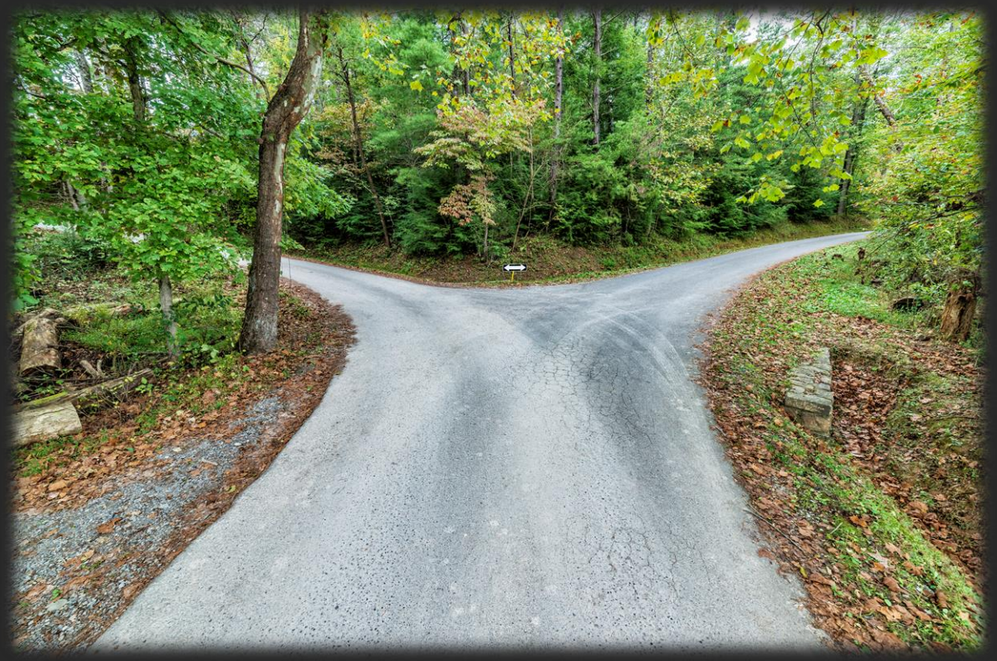
Autonomous systems



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

what **p ms** woul solve?

The path to autonomy has a fork in the road

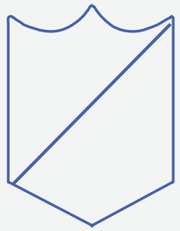


Some customers can leap to autonomy
&
some must incrementally upgrade to it

An Open, Secure and Data-driven Ecosystem provides the flexibility to pursue either path



Open

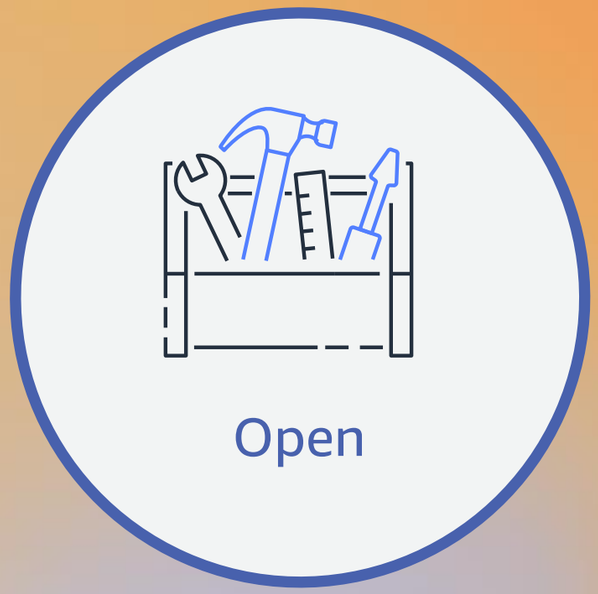


Secure



Data-driven

Open



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AWS IoT Greengrass launches support for Containers



Use AWS IoT Greengrass Containers to lift and shift legacy apps to the Edge

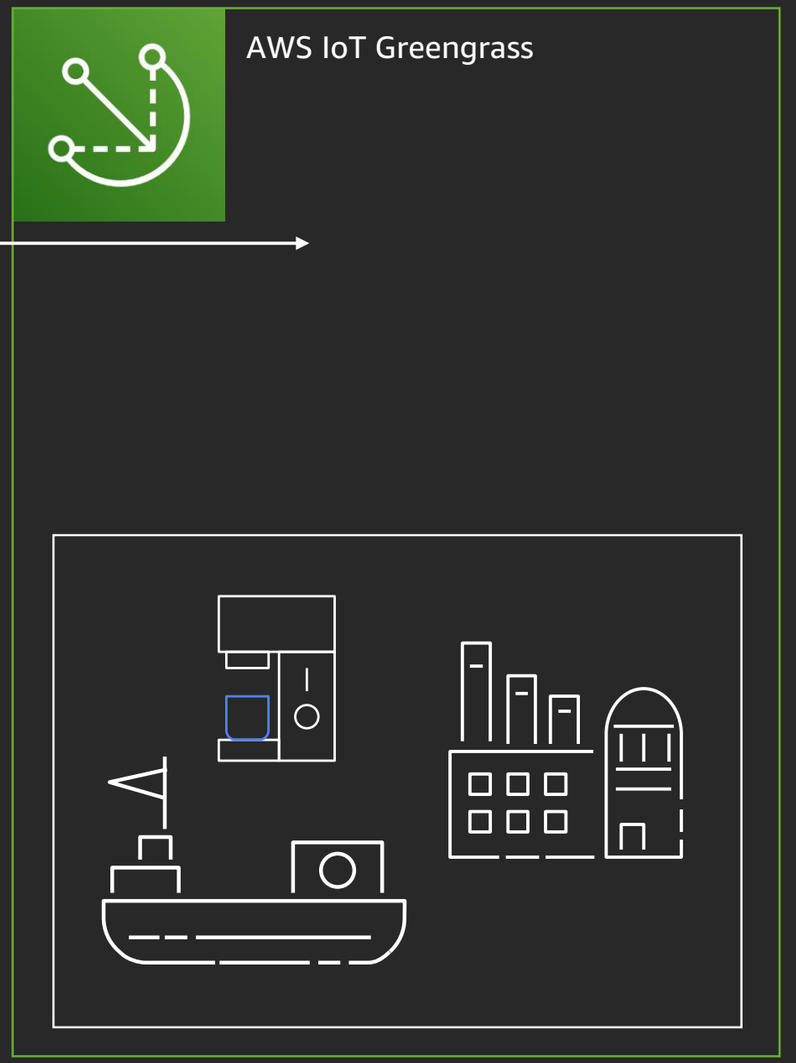


Container Image

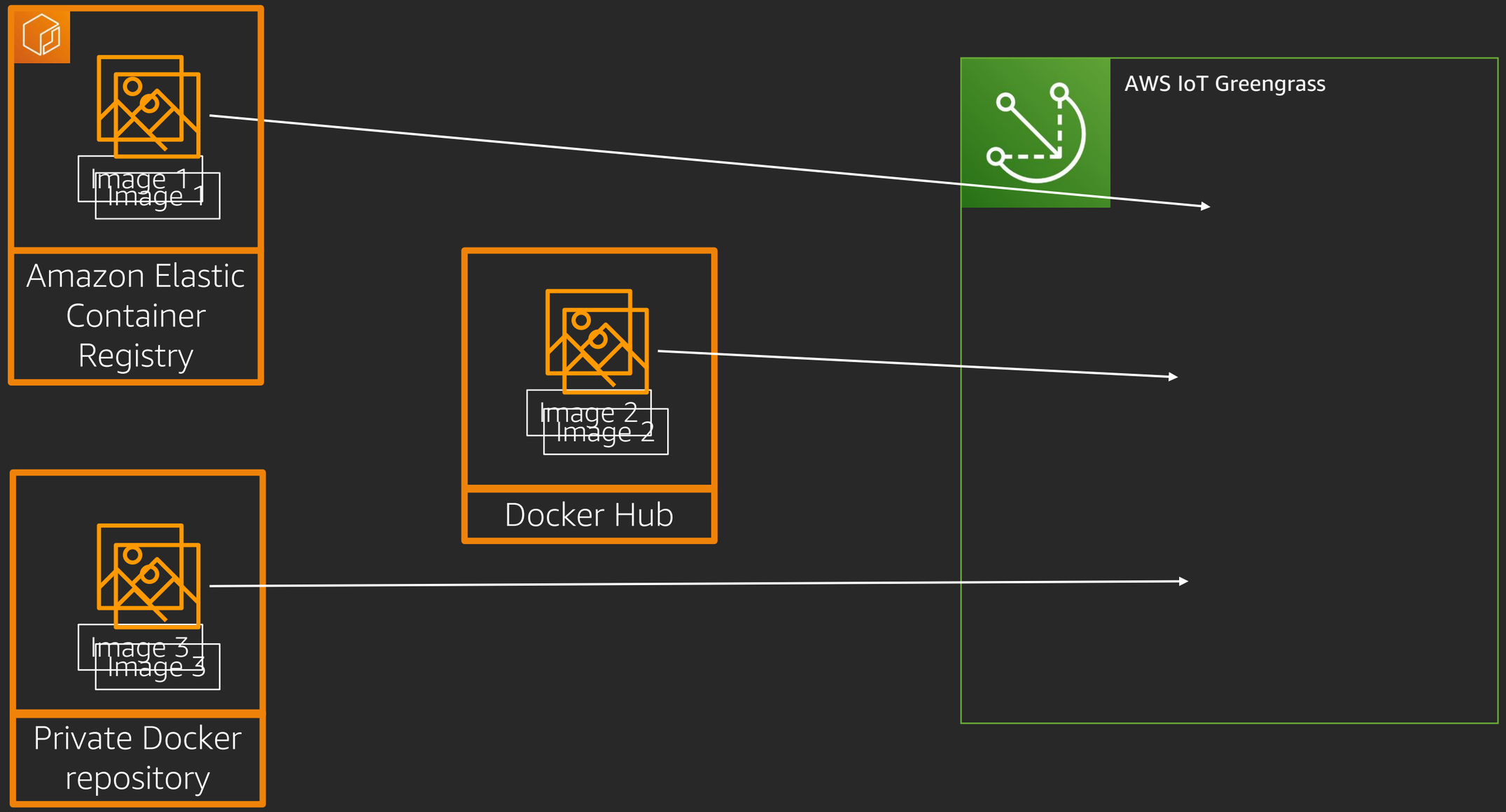




Existing Application



Pull images from multiple sources



ADLINK

Leading EDGE COMPUTING

Problem

ADLINK required more device and container management tools for their industrial edge solutions to help customers streamline and simplify the deployment of various applications.

Solution

ADLINK chose to integrate AWS IoT Greengrass into the manufacturing phase of their gateways as the software orchestration tool for the ADLINK Edge™ IoT solution.

Impact

Using container support for AWS IoT Greengrass, ADLINK is able to launch all required containers for ADLINK Edge™. ADLINK and their customers are now able to deploy diverse workloads on AWS IoT Greengrass without rewriting code and continue to develop new applications in languages and environments familiar to development teams.



"At ADLINK, the scope of our partner offerings is key to building the best solution to solve each customer's specific business problem. Container support for AWS IoT Greengrass is an exciting leap forward for our customers to deploy diverse workloads on AWS IoT Greengrass without rewriting code and continue to develop new applications in languages and environments familiar to development teams."

- Toby McClean, VP, IoT Solutions & Technology Innovation at ADLINK



Open Development

Amazon FreeRTOS development moved to GitHub

- Open to contributions from the community and support provided via forums
- Share code with fellow community members for faster development time

FreeRTOS kernel supports open architecture RISC-V

- Kernel ported to base RISC-V I profiles
- Preconfigured examples for dev boards and emulators



Secure



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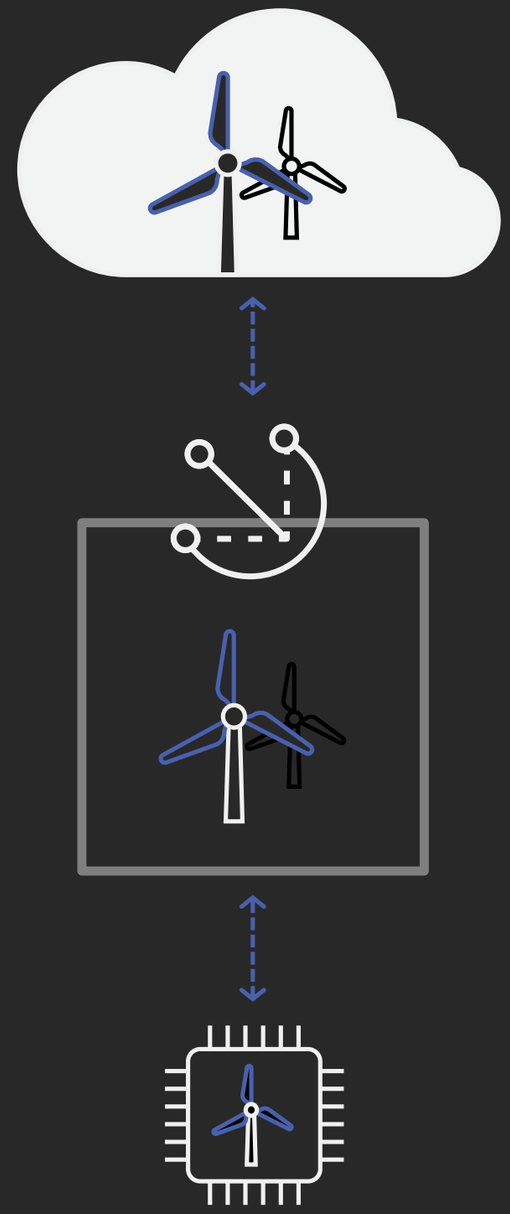
Security at the Edge

Authenticates and encrypts device data for local and cloud communications

Both Amazon FreeRTOS and AWS IoT Greengrass support TLS mutual authentication, both locally and with the cloud

Use AWS IoT Greengrass Secrets manager to securely store, access, rotate and manage secrets in the cloud and deploy locally on edge devices – including credentials for container registry access

Establish hardware-based root of trust for encrypting secrets used in local AWS Lambda functions and for storing private device keys



Use secure elements with Amazon FreeRTOS

Using a secure element enables tamperproof storage of cryptographic keys

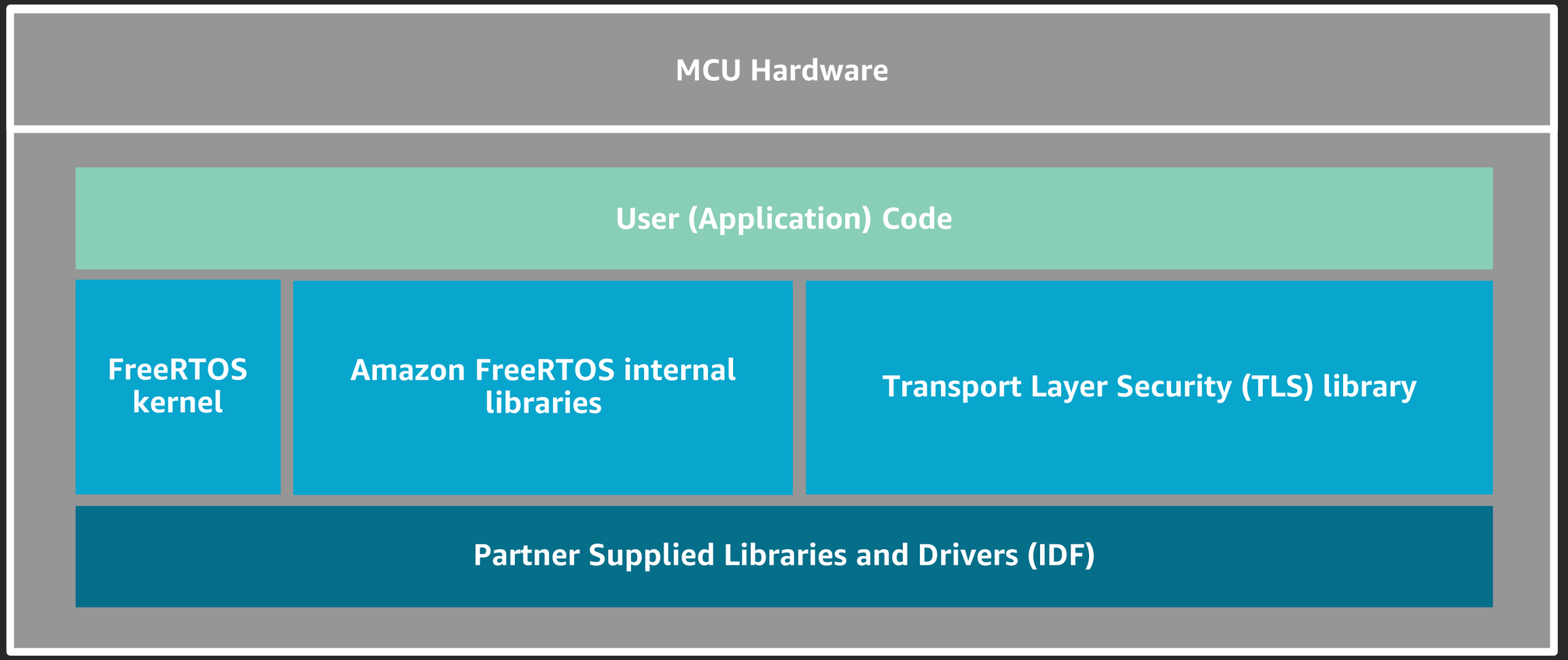
Uses open-standard PKCS#11 interfaces to ensure maximum compatibility

Enables customers to install devices in locations outside their physical control

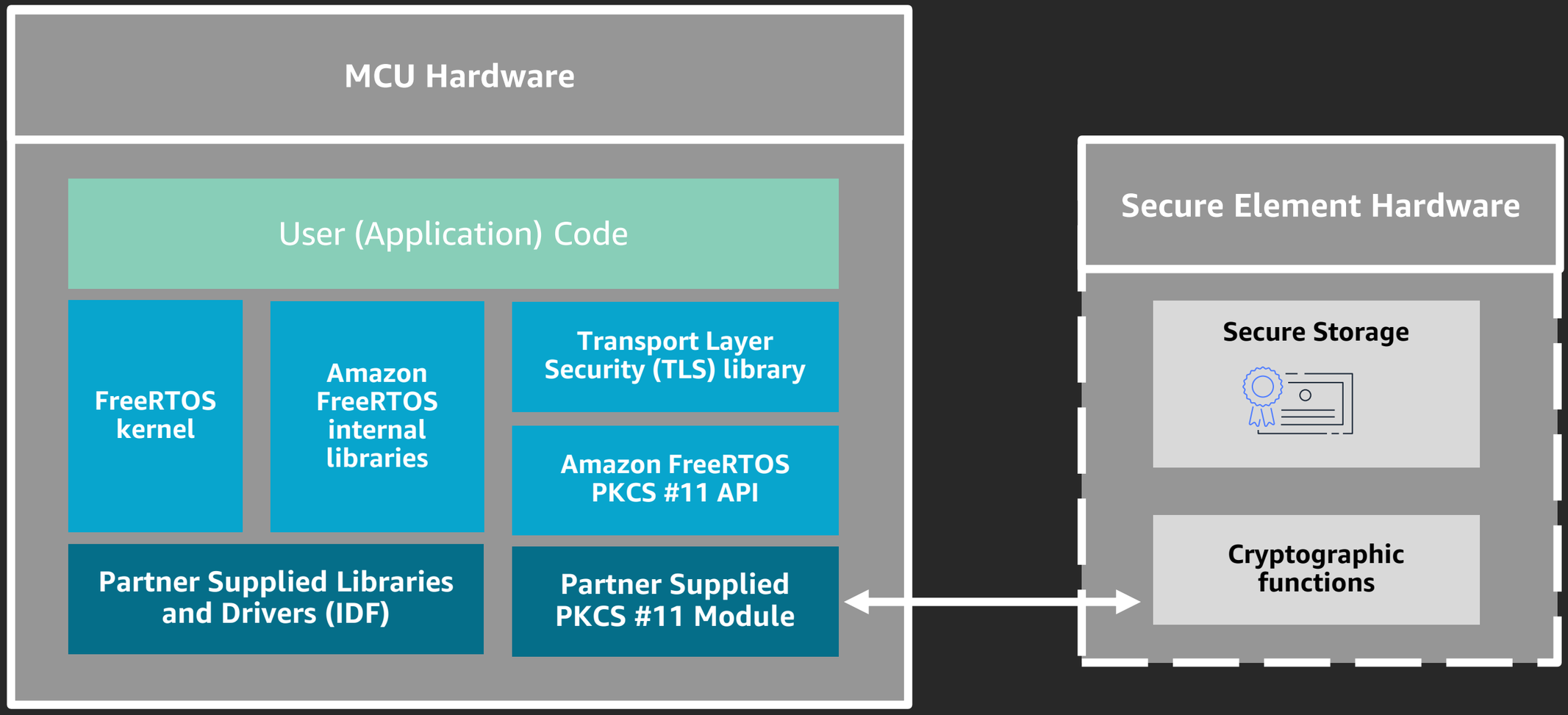
Offloads cryptographic functions from microcontroller freeing up memory space and reducing power consumption



Without a Secure Element



Use secure element support to encrypt data



Data-driven



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Build data-driven applications

AWS Iot Greengrass Connectors

Leverage pre-built integrations to send data to Twilio, ServiceNow, and other software as a service applications.

Device Shadows

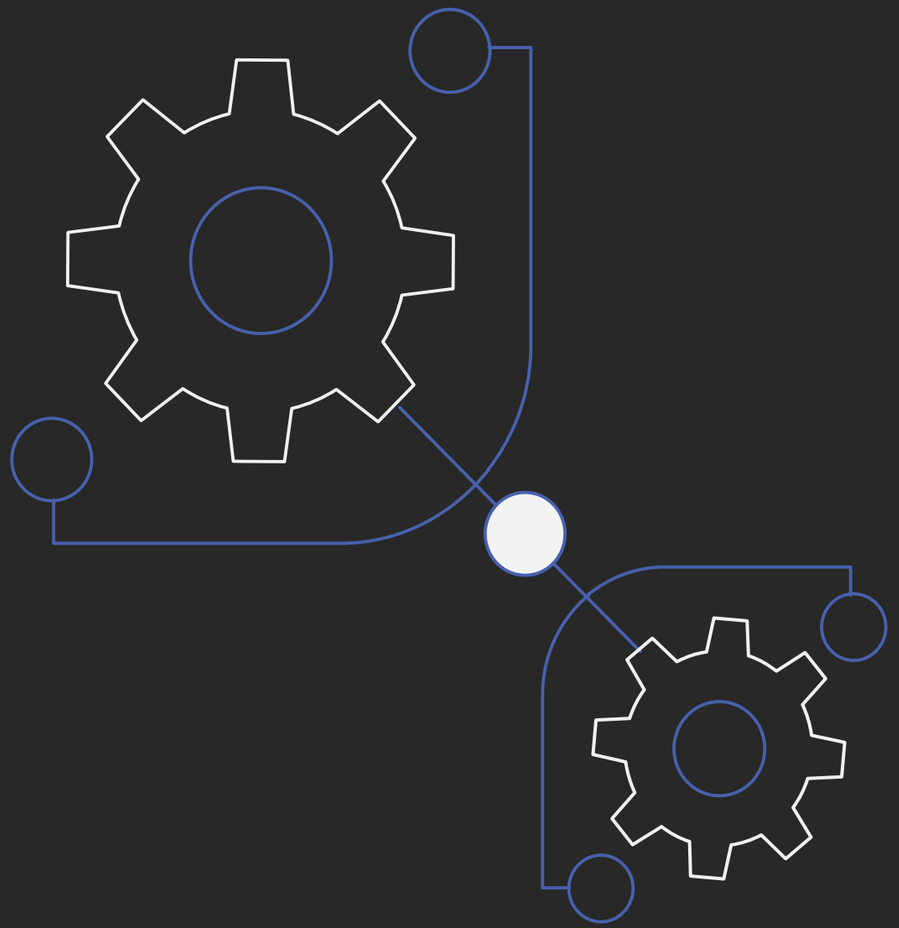
Define a device shadow state — for a single wind turbine, a windfarm, or a resource grid.

Operate devices during intermittent connectivity and synchronize to the cloud when reconnected.

ML Inference

Perform ML Inference locally reducing data transfer costs and latency or train models in the cloud using Amazon SageMaker or another service using Amazon EC2.

Transfer your trained models onto your device and also send data back to the cloud to improve model accuracy.



How do you help babies actually sleep like a baby?



Cradlewise



Problem

Cradlewise makes smart cradles for babies from 0 to 18 months of age. The cradle has critical requirements for being responsive with edge computing and also needs cloud infrastructure for complex, but less real time compute. Also, they needed to ensure parents would be able to connect to the cradle reliably using mobile devices to control, monitor, and manage alerts from the cradle.

Solution

Cradlewise chose to use AWS IoT Greengrass and AWS IoT Core to ensure reliable remote and at-home connectivity between mobile devices and the cradle. AWS IoT Greengrass keeps cradles operating even when internet is not available and helps in running and updating AWS Lambda functions.

Impact

AWS IoT provides a seamless way to handle edge and cloud computing as well as ensure reliable device connectivity. Cradlewise could therefore accelerate development of a secure smart-home product and get to market faster. Cradlewise through AWS IoT, is able to provide good sleep to babies and peace of mind to parents.

Over the air update architecture

Cradlewise

Amazon Simple Storage Service

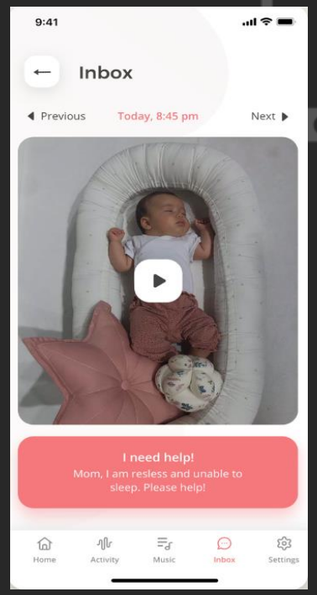
4. Download updated code and machine learning models

1. Send update trigger



2. Permission request

3. Permission grant



5. Status update

Configurable local and cloud storage using AWS IoT Greengrass stream manager

- Use simplified APIs for managing ingested data.
- Create streams and set policies for storage type, size, and data retention on a per-stream basis.
- Process and store data streams locally during intermittent connectivity - automatically resume export to AWS IoT Analytics or Amazon Kinesis when connectivity is restored.
- Combine with container support to run a database at the edge



LOCKHEED MARTIN

Problem

Lockheed Martin was looking to take the next leap in modern day manufacturing and decision making by creating a cyber-secure convergence of Operational Technology and Information Technology spanning their enterprise and facilities.

Solution

Lockheed Martin deployed AWS IoT services, including AWS IoT Core and AWS IoT Greengrass, to develop an IoT platform to power their Intelligent Factory solution. With Stream Manager for AWS IoT Greengrass, they will securely and reliably export streams of telemetry and production data from across their facilities directly to Amazon Kinesis Data Streams.

Impact

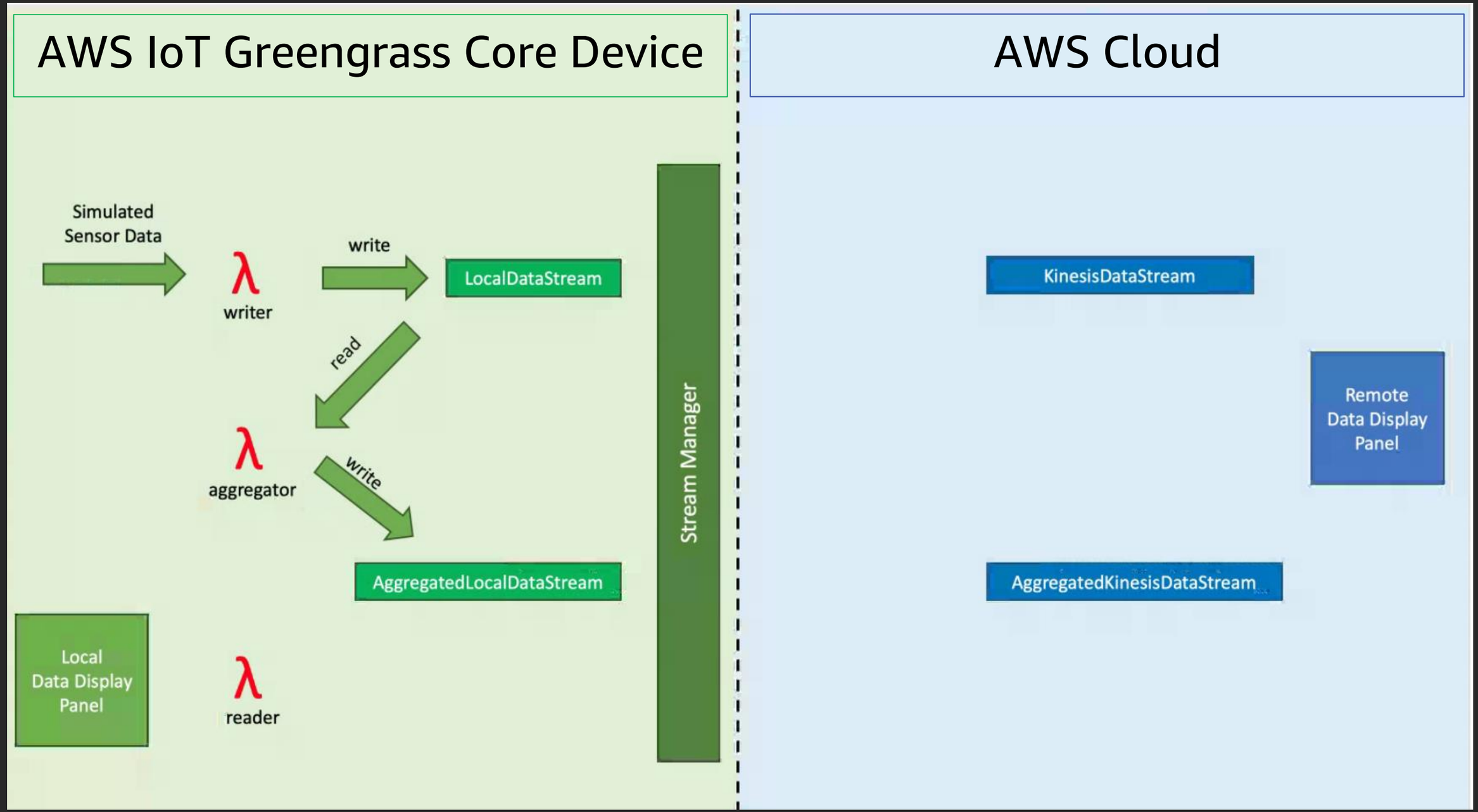
Today, Lockheed Martin has successfully captured valuable machine data across multiple business units within their production landscape. Creating data flows to their Data Lake in AWS GovCloud (US), they are developing a solution that eliminates paper waste, optimizes labor, and unlocks insights into their operations.



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Demo

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AWS IoT Greengrass Core Device
AWS Cloud
Simulated
Sensor Data
writer
write
LocalDataStream
read
aggregator
write
AggregatedLocalDataStream
Stream Manager
KinesisDataStream
Remote
Data Display
Panel
AggregatedKinesisDataStream
Local
Data Display
Panel
reader

localhost:5901 (ubuntu's X desktop (ip-172-31-45-193:1)) - VNC Viewer

Applications Places

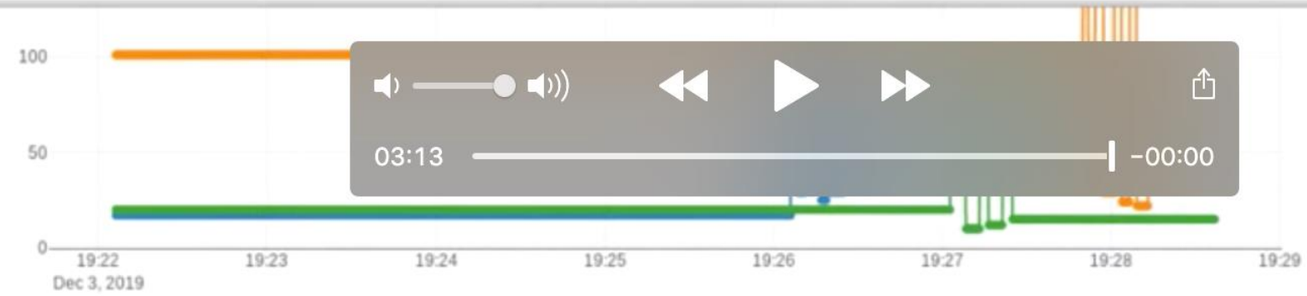
Terminal

File Edit View Search Terminal Tabs Help

Terminal

```
~/demo$ sudo ./start_ggc.sh
Setting up greengrass daemon
Validating hardlink/softlink protection
Waiting for up to 1m10s for Daemon to start

Greengrass successfully started with PID: 27290
~/demo$ sudo ./disable_network.sh
~/demo$ sudo ./re_enable_network.sh
~/demo$
```

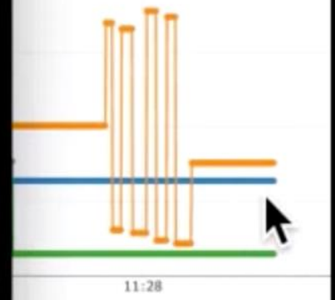


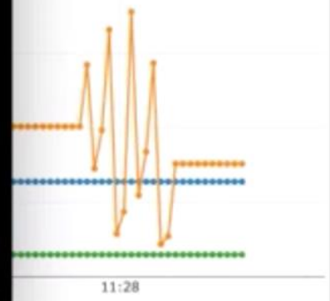
03:13 -00:00

Home Terminal Sensor Panel - Mozilla ...

Macintosh HD

JAR

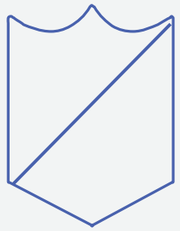




Customers want an Open and Secure and Data-driven ecosystem



Open



Secure



Data-driven

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

what **problems** would you solve?

how would you solve them **differently** using fully autonomous systems?

how can you leverage our **open, secure,** and **data-driven** device software?

Related breakouts



IOT207 - Digital transformation and IoT monetization

AMZ303 - Modernizing Amazon warehouse device connections

AMZ305 - Building a virtual fob with Amazon Key for Business

IOT306 - Designing secure IoT solutions from the edge to cloud

IOT312 - AWS IoT and industrial automation at Amazon

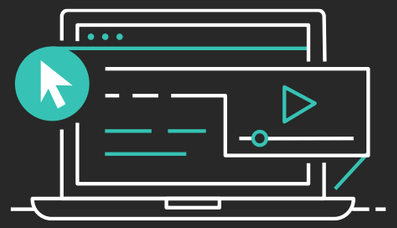
IOT337 - AWS IoT: How low can you go

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- AWS IoT Greengrass
- AWS IoT Analytics
- AWS IoT Device Management
- AWS IoT Events

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aws training and certification

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aws



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