AWS for IoT

AWS for IoT

What can we do for your $$$?

AWS

AWS

AWS

Alexa for Business, Amazon API Gateway, Amazon API Gateway, Amazon AppStream 2.0, Amazon Athena, Amazon Aurora, Amazon Chime, Amazon Cloud Directory, Amazon CloudFront, Amazon CloudSearch, Amazon CloudWatch, Amazon Cognito, Amazon Comprehend, Amazon Connect, Amazon DynamoDB, Amazon EBS, Amazon EC2, Amazon EC2 Auto Scaling, Amazon Elastic Container Registry, Amazon Elastic Container Service, Amazon Elastic Container Service for Kubernetes, Amazon Elastic File System, Amazon Elastic Transcoder, Amazon ElastiCache, Amazon Elasticsearch Service, Amazon EMR, Amazon FreeRTOS, Amazon GameLift, Amazon Glacier, Amazon GuardDuty, Amazon Inspector, Amazon Kinesis, Amazon Kinesis Video Streams, Amazon Lex, Amazon Lightsail, Amazon Lumberyard, Amazon Machine Learning, Amazon Macie, Amazon MQ, Amazon Neptune, Amazon Pinpoint, Amazon Pinpoint, Amazon Polly, Amazon Quicksight, Amazon RDS, Amazon Redshift, Amazon Redshift, Amazon Rekognition, Amazon Route 53, Amazon S3, Amazon SageMaker, Amazon Simple Email Service (SES), Amazon Simple Notification Service (SNS), Amazon Simple Queue Service (SQS), Amazon Sumerian, Amazon Transcribe, Amazon Translate, Amazon VPC, Amazon VPC PrivateLink, Amazon WorkDocs, Amazon WorkMail, Amazon WorkSpaces, Apache MXNet on AWS, AWS Application Discovery Service, AWS AppSync, AWS Artifact, AWS Auto Scaling, AWS Batch, AWS Certificate Manager, AWS Cloud9, AWS CloudFormation, AWS CloudHSM, AWS CloudTrail, AWS CodeBuild, AWS CodeCommit, AWS CodeDeploy, AWS CodePipeline, AWS CodeStar, AWS Command Line Interface, AWS Config, AWS Data Pipeline, AWS Database Migration Service, AWS Database Migration Service, AWS Deep Learning AMIs, AWS DeepLens, AWS Device Farm, AWS Direct Connect, AWS Directory Service, AWS Elastic Beanstalk, AWS Elemental MediaConvert, AWS Elemental MediaLive, AWS Elemental MediaPackage, AWS Elemental MediaStore, AWS Elemental MediaTailor, AWS Fargate, AWS Firewall Manager, AWS Glue, AWS Greengrass, AWS Identity & Access Management, AWS IoT 1-Click, AWS IoT Analytics, AWS IoT Button, AWS IoT Core, AWS IoT Device Defender, AWS IoT Device Management, AWS Key Management Service, AWS Lambda, AWS Migration Hub, AWS Mobile Hub, AWS Mobile SDK, AWS OpsWorks, AWS Organizations, AWS Personal Health Dashboard, AWS Secrets Manager, AWS Server Migration Service, AWS Serverless Application Repository, AWS Service Catalog, AWS Shield, AWS Single Sign-On, AWS Snowball, AWS Snowball, AWS Snowball Edge, AWS Snowball Edge, AWS Snowmobile, AWS Snowmobile, AWS Step Functions, AWS Storage Gateway, AWS Systems Manager, AWS Trusted Advisor, AWS WAF, AWS X-Ray, Elastic Load Balancing, TensorFlow on AWS, VMware Cloud on AWS

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Software

Amazon FreeRTOS

Amazon FreeRTOS

OS for **microcontrollers**.

Amazon FreeRTOS

OS for **microcontrollers**.

Based on FreeRTOS.

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OS for **microcontrollers**.

Based on FreeRTOS.

Optimized for **low-power devices**.

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Optimized for **low-power devices**.

Integrated with AWS services.

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Many exisiting libraries dedicated to easy deploys and updates.

Amazon FreeRTOS

OS for **microcontrollers**.

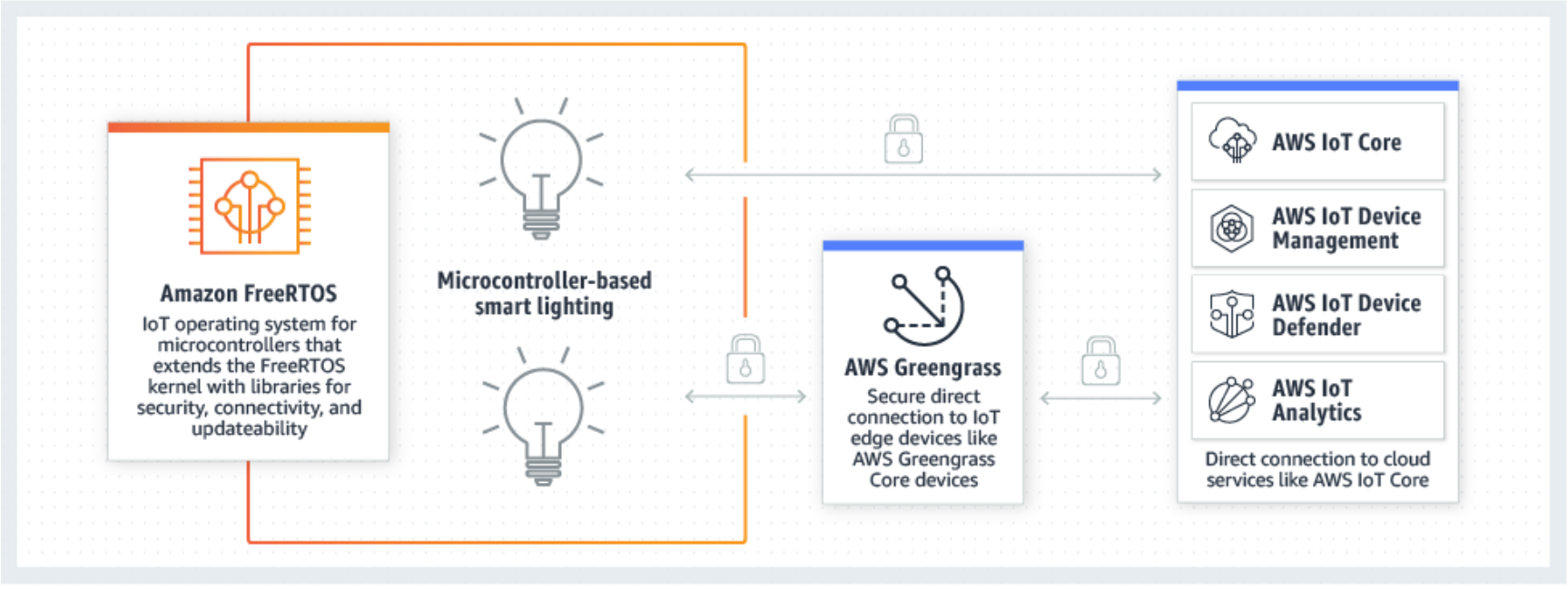
Based on FreeRTOS.

Optimized for **low-power devices**.

Integrated with AWS services.

Many exisiting libraries dedicated to easy deploys and updates.

Network **security built-in**.


Amazon FreeRTOS
IoT operating system for microcontrollers that extends the FreeRTOS kernel with libraries for security, connectivity, and updateability
Microcontroller-based smart lighting
AWS Greengrass
Secure direct connection to IoT edge devices like AWS Greengrass Core devices
AWS IoT Core
AWS IoT Device Management
AWS IoT Device Defender
AWS IoT Analytics
Direct connection to cloud services like AWS IoT Core

AWS Greengrass

AWS Greengrass

Devices **aggregator**.

AWS Greengrass

Devices **aggregator**.
Communicate and sync even **offline devices**.

AWS Greengrass

Devices **aggregator**.
Communicate and sync even **offline devices**.
Protocol optimized for **minimizing bandwith**.

Greengrass Group

A defined group of Greengrass Cores and other devices that are configured to communicate with one another. A Greengrass Group may represent one floor of a building, one truck, or one home.

Cloud

Greengrass Core

The Greengrass Core is the runtime that enables the local execution of AWS Lambda, messaging, device shadows, and security. The Greengrass Core interacts directly with the cloud and works locally, even with intermittent connection

Device

Any device using Amazon FreeRTOS or IoT Device SDK can be configured to interact with Greengrass Core via the local network

AWS Greengrass ML

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Abstracts ML work from your devices.

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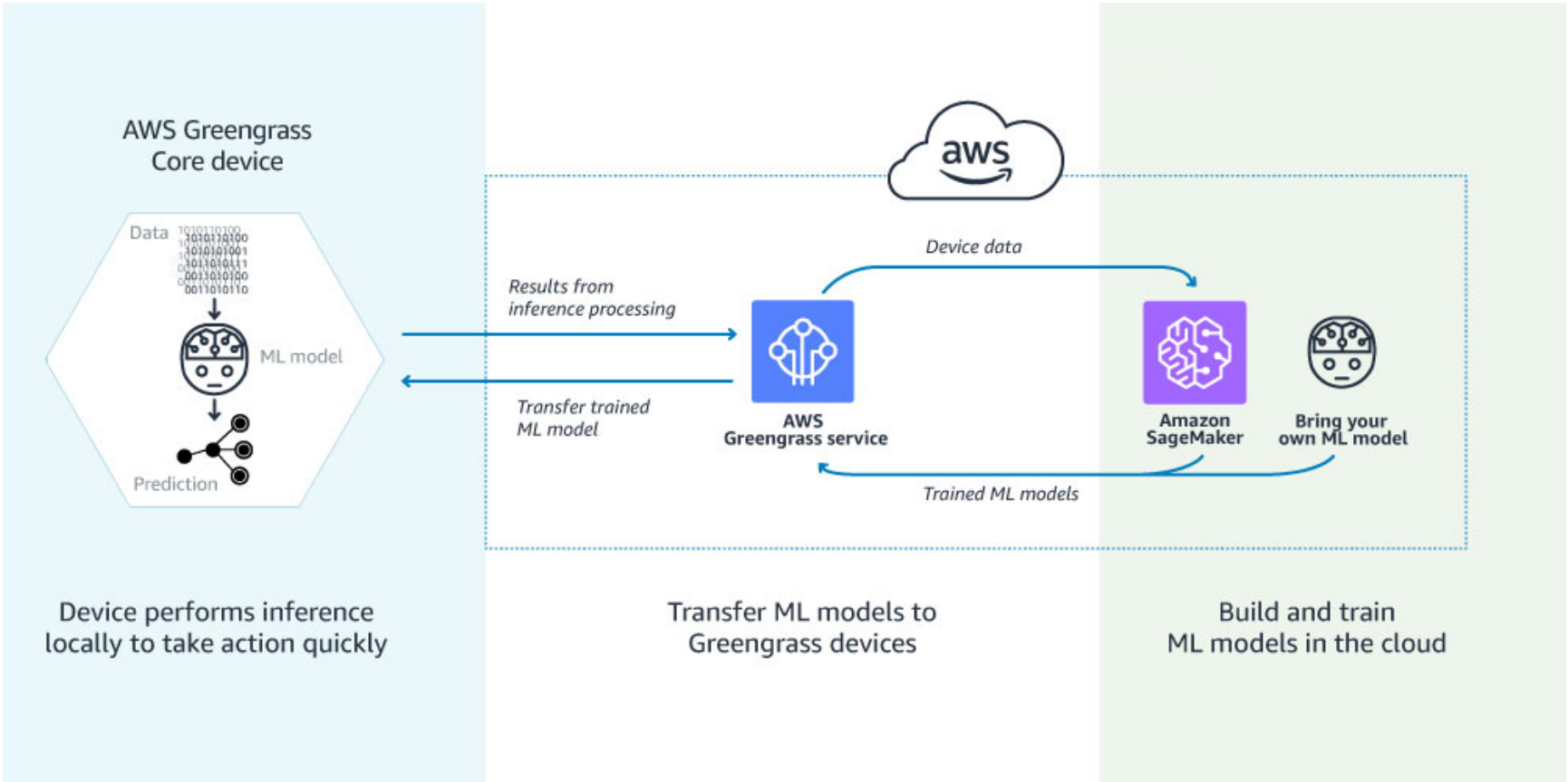
Abstracts ML work from your devices.
Automatically fallbacks to cloud **if needed**.

AWS Greengrass ML

Abstracts ML work from your devices.
Automatically fallbacks to cloud **if needed**.
Integrated with TensorFlow, Apache MXNet and Chainer.

AWS Greengrass ML

Abstracts ML work from your devices.
Automatically fallbacks to cloud **if needed**.
Integrated with TensorFlow, Apache MXNet and Chainer.
Compatible with Intel Atom, NVIDIA Jetson TX2 and Raspberry PI.


AWS Greengrass
Core device
Data
ML model
Prediction
aws
Results from
inference processing
Transfer trained
ML model
AWS
Greengrass service
Device data
Amazon
SageMaker
Bring your
own ML model
Trained ML models
Device performs inference
locally to take action quickly
Transfer ML models to
Greengrass devices
Build and train
ML models in the cloud

Services

AWS IoT Core

AWS IoT Core

Managed **message bus**.

AWS IoT Core

Managed **message bus**.
Built-in **message queueing**.

AWS IoT Core

Managed **message bus**.

Built-in **message queueing**.

Routes messages to *non-IoT* services, like AWS Lambda.

Devices publish & subscribe

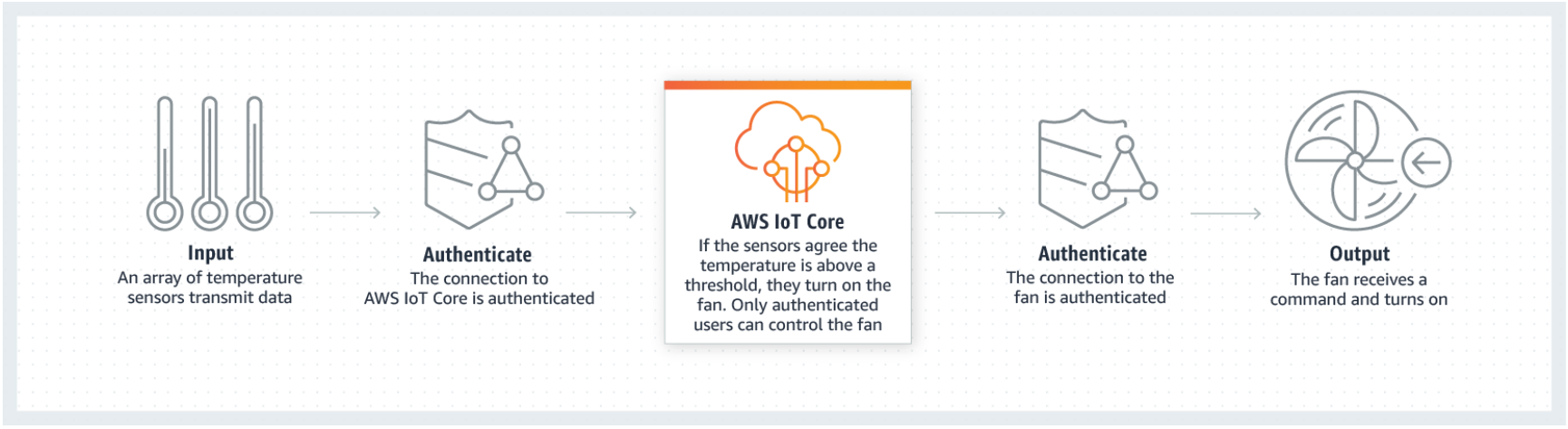
Billions of devices can publish and subscribe to messages

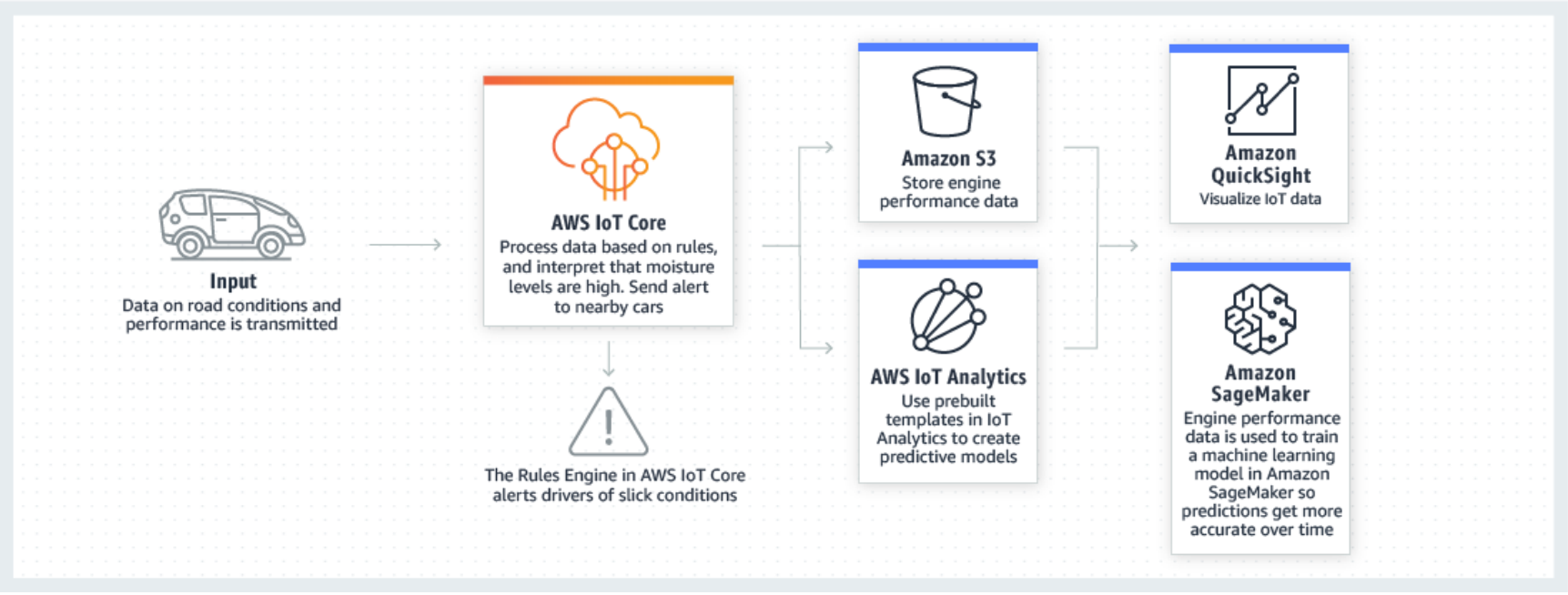
AWS IoT Core

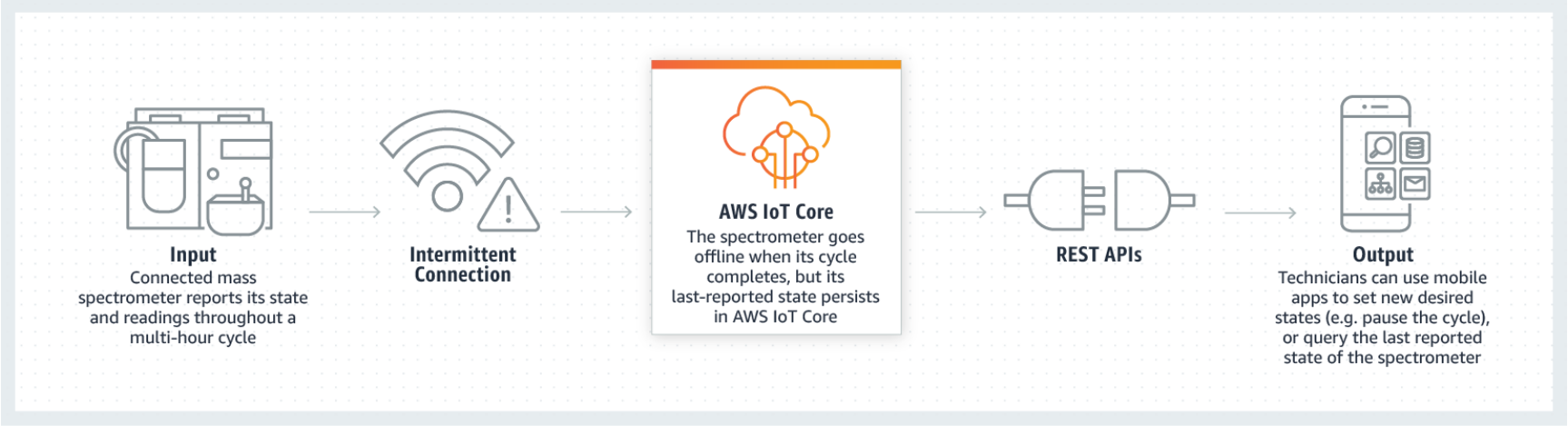
Messages are transmitted and received using the MQTT protocol which minimizes the code footprint on the device and reduces network bandwidth requirements

Devices communicate

AWS IoT Core enables devices to communicate with AWS services and each other


Input
An array of temperature sensors transmit data
Authenticate
The connection to AWS IoT Core is authenticated
AWS IoT Core
If the sensors agree the temperature is above a threshold, they turn on the fan. Only authenticated users can control the fan
Authenticate
The connection to the fan is authenticated
Output
The fan receives a command and turns on


Input
Data on road conditions and performance is transmitted
AWS IoT Core
Process data based on rules, and interpret that moisture levels are high. Send alert to nearby cars
The Rules Engine in AWS IoT Core alerts drivers of slick conditions
Amazon S3
Store engine performance data
AWS IoT Analytics
Use prebuilt templates in IoT Analytics to create predictive models
Amazon QuickSight
Visualize IoT data
Amazon SageMaker
Engine performance data is used to train a machine learning model in Amazon SageMaker so predictions get more accurate over time


Input
Connected mass spectrometer reports its state and readings throughout a multi-hour cycle
Intermittent Connection
AWS IoT Core
The spectrometer goes offline when its cycle completes, but its last-reported state persists in AWS IoT Core
REST APIs
Output
Technicians can use mobile apps to set new desired states (e.g. pause the cycle), or query the last reported state of the spectrometer

AWS IoT Device Management

AWS IoT Device Management

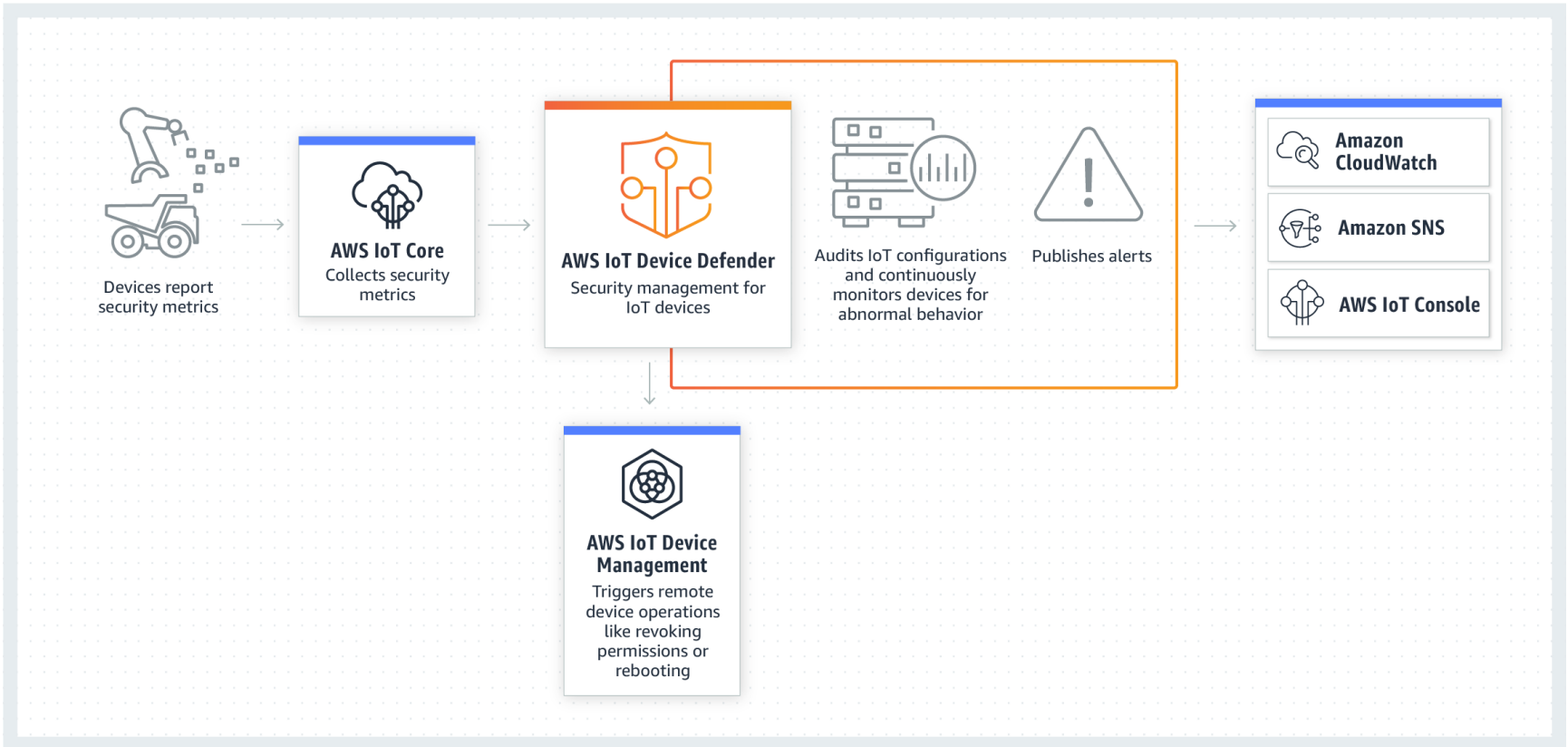
Organize and **monitor** your IoT devices.

AWS IoT Device Management

Organize and **monitor** your IoT devices.
Remotely trobleshoot problems.

AWS IoT Device Management

Organize and **monitor** your IoT devices.
Remotely trobleshoot problems.
Send **over-the-air updates**.


Devices report security metrics
AWS IoT Core
Collects security metrics
AWS IoT Device Defender
Security management for IoT devices
Audits IoT configurations and continuously monitors devices for abnormal behavior
Publishes alerts
Amazon CloudWatch
Amazon SNS
AWS IoT Console
AWS IoT Device Management
Triggers remote device operations like revoking permissions or rebooting

AWS IoT Device Defender

AWS IoT Device Defender

Continous **auditing** of IoT devices.

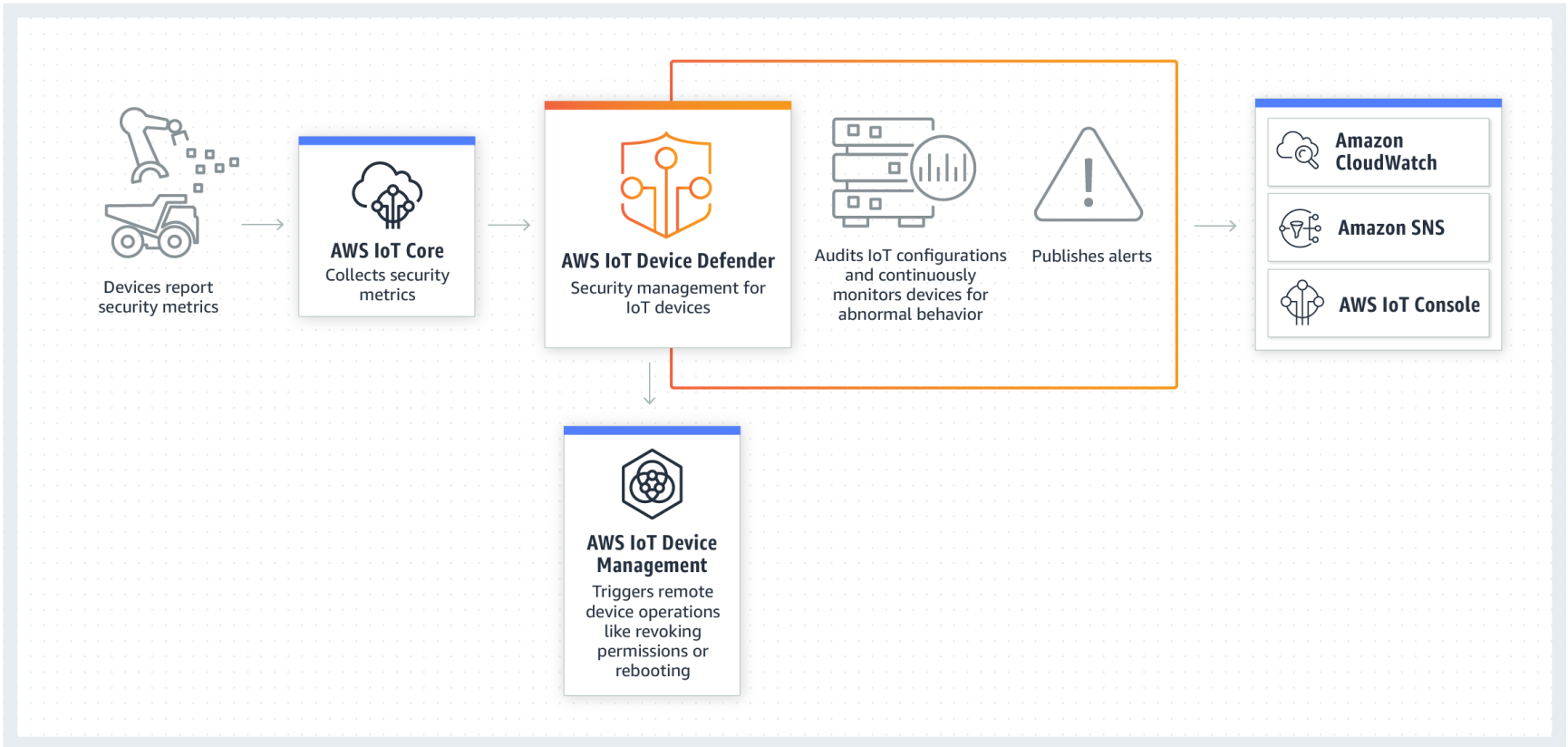
AWS IoT Device Defender

Continous **auditing** of IoT devices.

Encrypted authentication and authorization.

AWS IoT Device Defender

Continous **auditing** of IoT devices.
Encrypted authentication and authorization.
Automatically alerts on *non-appriopiate* behaviours, like DDoS.


Devices report security metrics
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Collects security metrics
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Publishes alerts
Amazon CloudWatch
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AWS IoT Console
AWS IoT Device Management
Triggers remote device operations like revoking permissions or rebooting

AWS IoT Analytics

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Analyze **massive** amounts of data.

AWS IoT Analytics

Analyze **massive** amounts of data.
Specialized for **unstructured informations**.

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Analyze **massive** amounts of data.
Specialized for **unstructured informations**.
Integrated with AWS ML services.

AWS IoT Analytics

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Specialized for **unstructured informations**.

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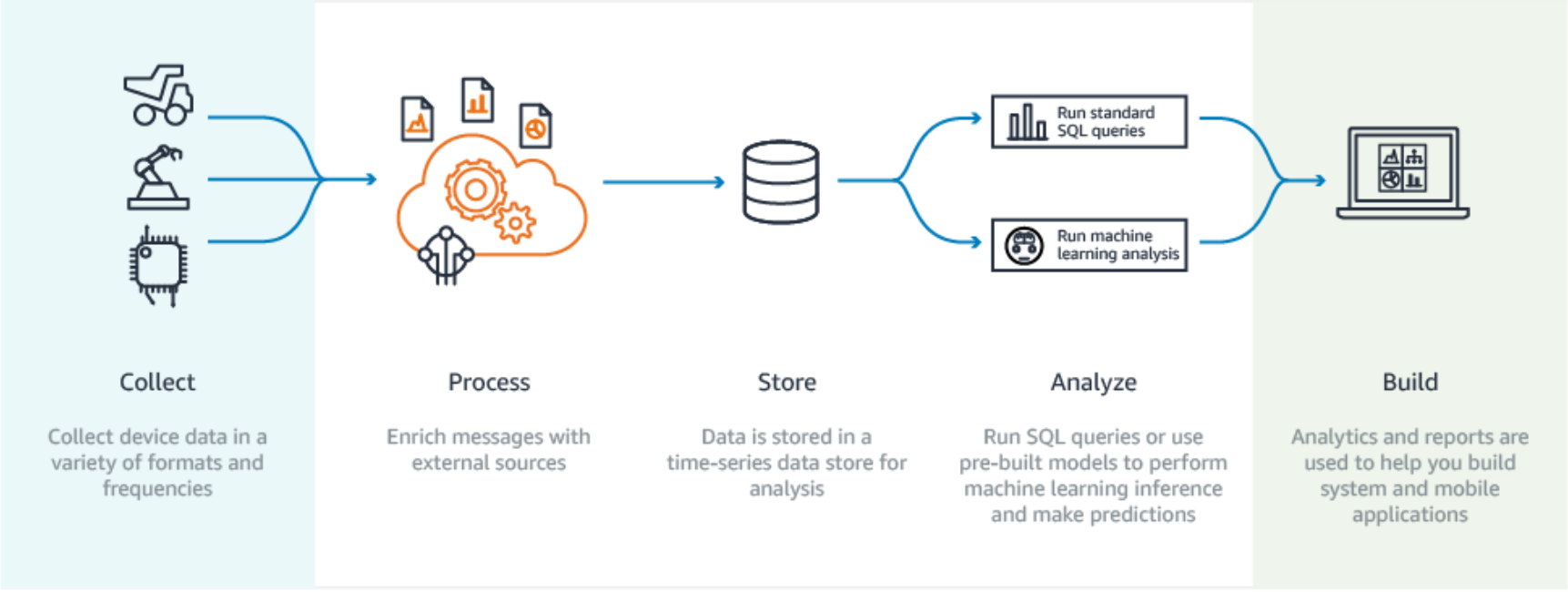
Works **out-of-box** with tools like Jupyter Notebook, Matlab or GNU Octave.


Run standard SQL queries
Run machine learning analysis
Collect
Collect device data in a variety of formats and frequencies
Process
Enrich messages with external sources
Store
Data is stored in a time-series data store for analysis
Analyze
Run SQL queries or use pre-built models to perform machine learning inference and make predictions
Build
Analytics and reports are used to help you build system and mobile applications

Bonus

AWS IoT Button

AWS IoT Button

Programmable button.

AWS IoT Button

Programmable button.

Based on Amazon Dash Button hardware.

AWS IoT

Case study: iRobot

Based on an official case study

iRobot

iRobot

14 000 Roomba Vacuums sold on first Amazon Prime Day.

iRobot

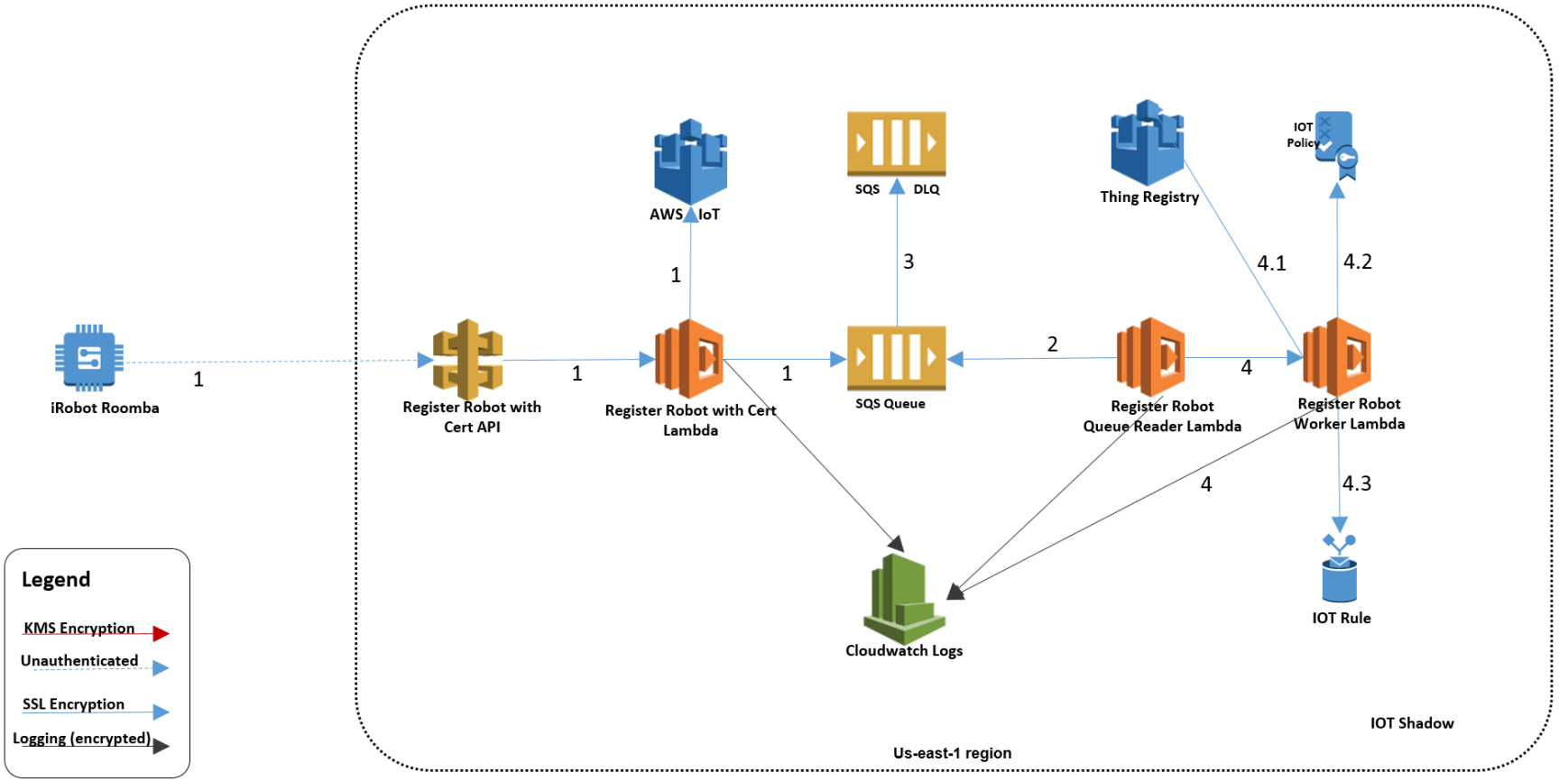
14 000 Roomba Vacuums sold on first Amazon Prime Day.
More than **20 millions** in total.

iRobot

14 000 Roomba Vacuums sold on first Amazon Prime Day.

More than **20 millions** in total.

Fewer than **10 people** manage the whole architecture.


iRobot Roomba
1
Register Robot with Cert API
1
Register Robot with Cert Lambda
1
AWS IoT
1
SQS
DLQ
3
SQS Queue
2
Thing Registry
Register Robot Queue Reader Lambda
4
IOT Policy
4.1
4.2
Register Robot Worker Lambda
4
4.3
IOT Rule
Cloudwatch Logs
IOT Shadow
Us-east-1 region
Legend
KMS Encryption
Unauthenticated
SSL Encryption
Logging (encrypted)

Case study: Springworks

Based on an official case study

Springworks

Springworks

What if your car could talk to you?

Springworks

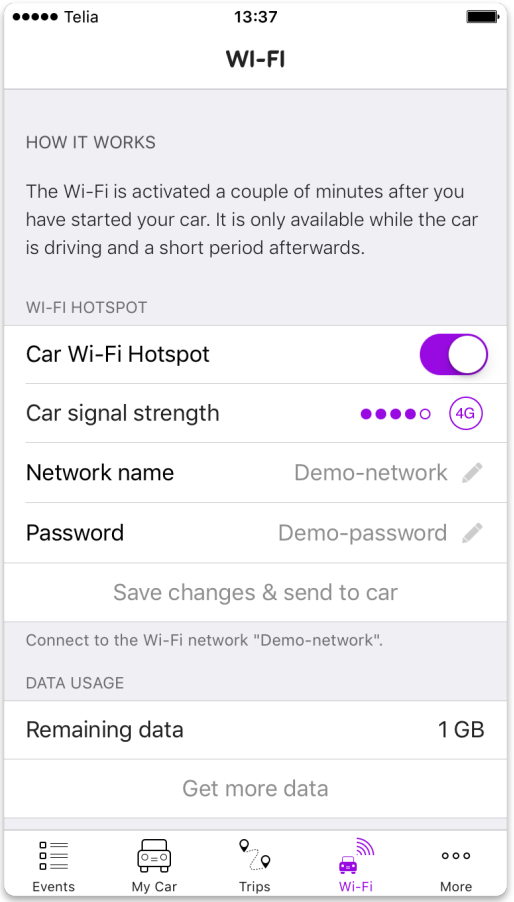
What if your car could talk to you?
What if it could warn you about service deadlines ahead of time?

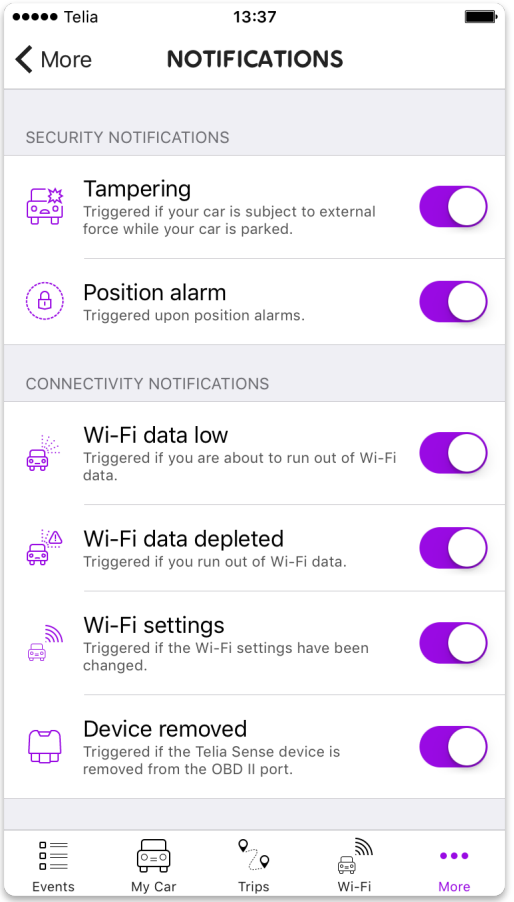
Springworks

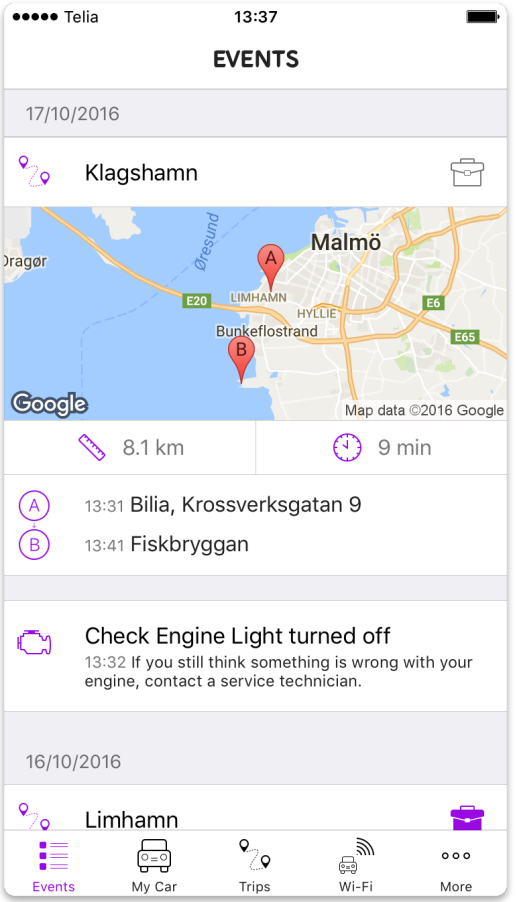
What if your car could talk to you?
What if it could warn you about service deadlines ahead of time?
What if it could direct you to the nearest service provider?

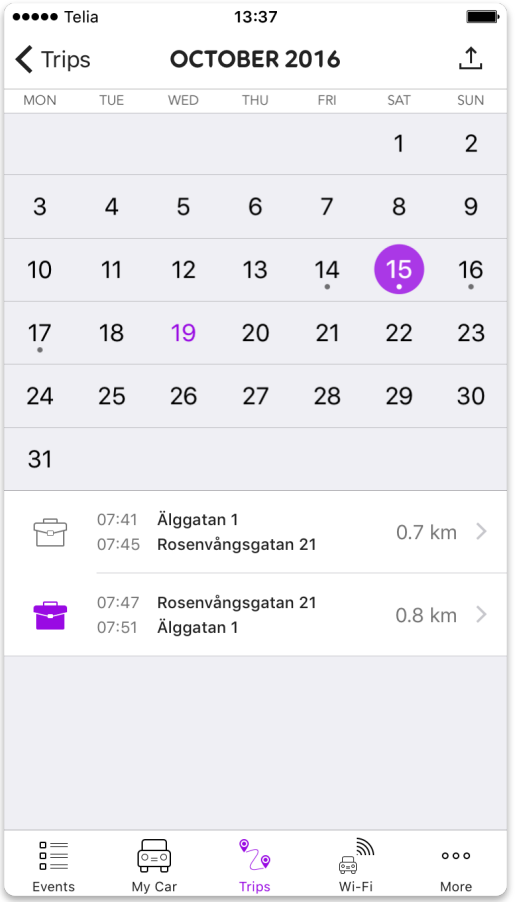
Springworks

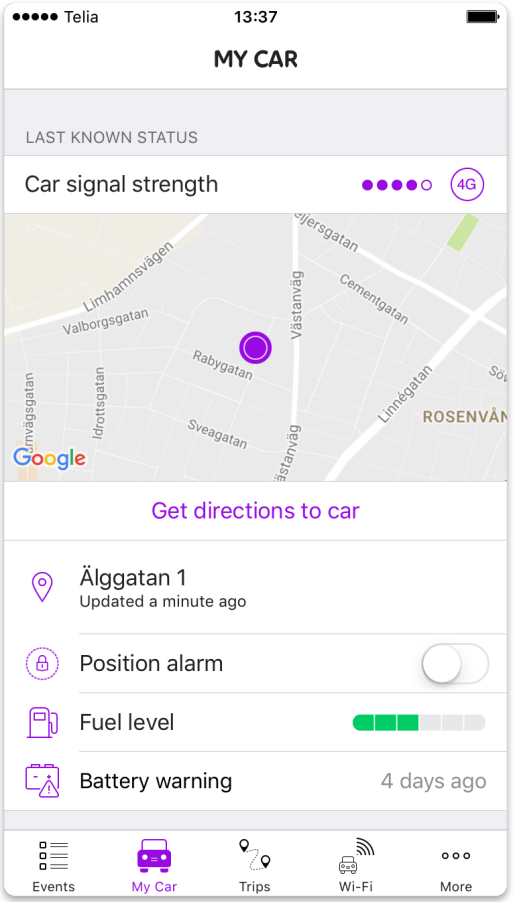
Well, now it can.


Telia 13:37
WI-FI
HOW IT WORKS
The Wi-Fi is activated a couple of minutes after you have started your car. It is only available while the car is driving and a short period afterwards.
WI-FI HOTSPOT
Car Wi-Fi Hotspot
Car signal strength
4G
Network name
Demo-network
Password
Demo-password
Save changes & send to car
Connect to the Wi-Fi network "Demo-network".
DATA USAGE
Remaining data
1 GB
Get more data
Events
My Car
Trips
Wi-Fi
More


Telia 13:37
More
NOTIFICATIONS
SECURITY NOTIFICATIONS
Tampering
Triggered if your car is subject to external force while your car is parked.
Position alarm
Triggered upon position alarms.
CONNECTIVITY NOTIFICATIONS
Wi-Fi data low
Triggered if you are about to run out of Wi-Fi data.
Wi-Fi data depleted
Triggered if you run out of Wi-Fi data.
Wi-Fi settings
Triggered if the Wi-Fi settings have been changed.
Device removed
Triggered if the Telia Sense device is removed from the OBD II port.
Events
My Car
Trips
Wi-Fi
More


Telia 13:37
EVENTS
17/10/2016
Klagshamn
Malmö
LIMHAMN
HYLLIE
Bunkeflostrand
E20
E6
E65
Google
Map data ©2016 Google
8.1 km
9 min
A 13:31 Bilia, Krossverksgatan 9
B 13:41 Fiskbryggan
Check Engine Light turned off
13:32 If you still think something is wrong with your engine, contact a service technician.
16/10/2016
Limhamn
Events
My Car
Trips
Wi-Fi
More


Telia
13:37
Trips
OCTOBER 2016
MON TUE WED THU FRI SAT SUN
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
07:41 Älggatan 1
07:45 Rosenvångsgatan 21
0.7 km
07:47 Rosenvångsgatan 21
07:51 Älggatan 1
0.8 km
Events
My Car
Trips
Wi-Fi
More


Telia
13:37
MY CAR
LAST KNOWN STATUS
Car signal strength
4G
Limhamnsvägen
Valborgsgatan
Rabygatan
Västanväg
Cementgatan
Idrottsgatan
Sveagatan
Linnégatan
Google
Get directions to car
Älggatan 1
Updated a minute ago
Position alarm
Fuel level
Battery warning
4 days ago
Events
My Car
Trips
Wi-Fi
More

Springworks

Springworks

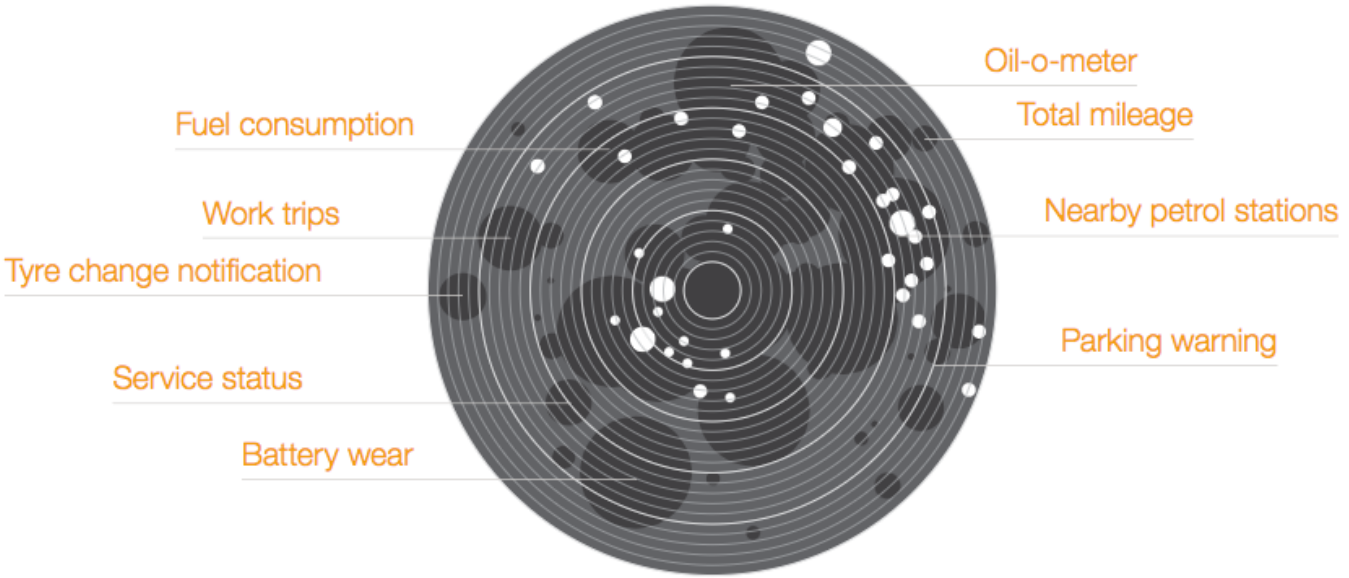
More than **10 000** data points per day.

Springworks

More than **10 000** data points per day.
Over **20 million** cars connected.

Springworks

More than **10 000** data points per day.
Over **20 million** cars connected.
Several **bilions** of data points.


Oil-o-meter
Total mileage
Fuel consumption
Work trips
Nearby petrol stations
Tyre change notification
Parking warning
Service status
Battery wear

Sources

amazon.com

aws.amazon.com

irobot.com

springworks.se

Thank you!