



AWS in Automotive

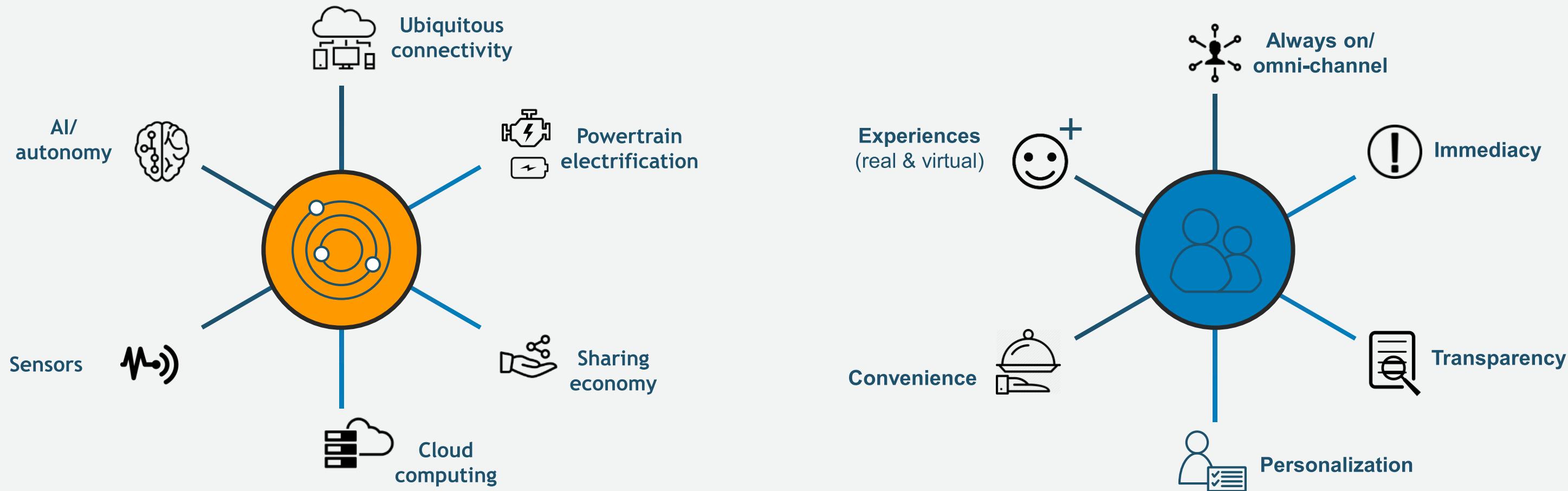
Deven Suri (Account Manager)
Chetan Agrawal (Solutions Architect)
<https://aws.amazon.com/automotive>



Automotive Transformation

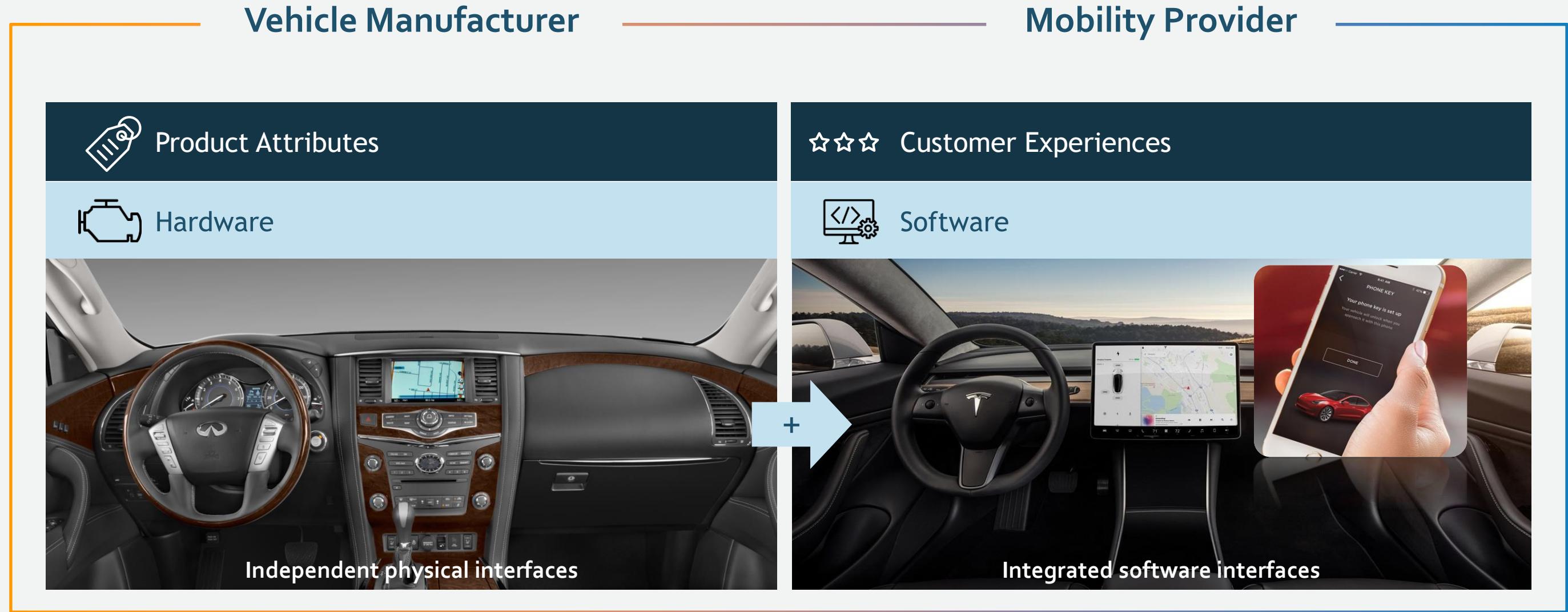
Unprecedented convergence of technology and consumer trends

Transformational Technology ← → Consumer Trends



Automotive transformation

Every automotive company needs to also be a software company



Key areas of Digital Transformation

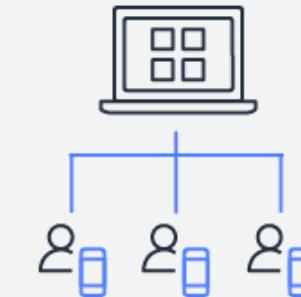
Connected Vehicle Services



ADAS and Autonomous Driving Development



Digital Customer Engagement

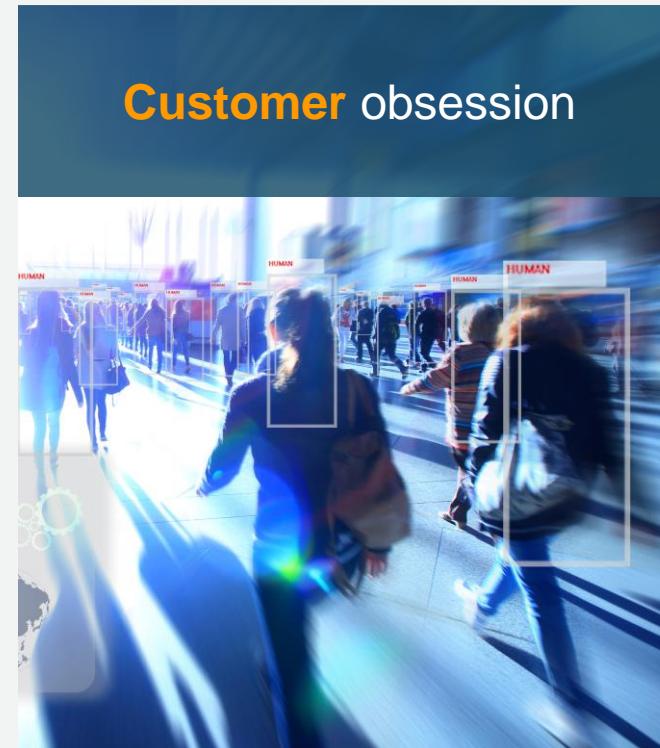


Keys to Amazon Web Services success

Applying Amazon.com concepts to IT infrastructure



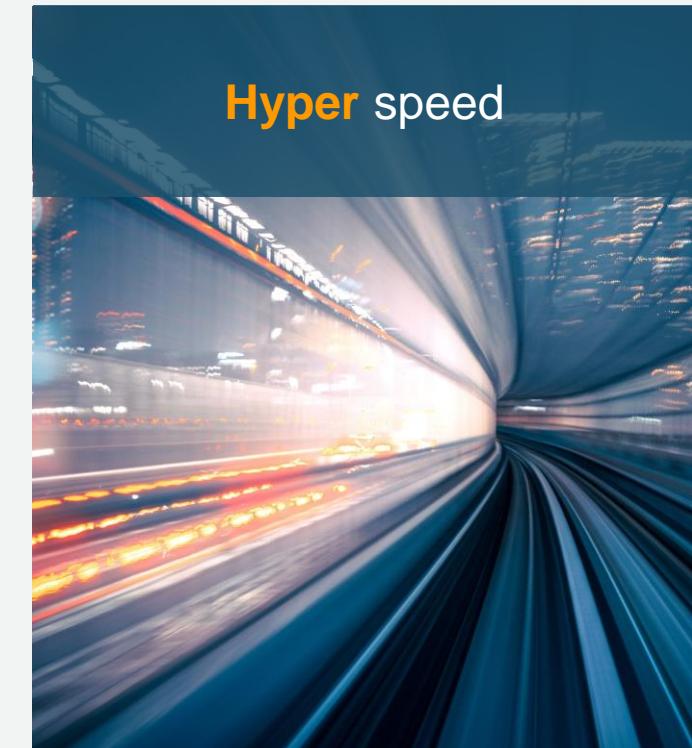
190+ services, 2200+ new features in 2019



77 price reductions since launch in 2006



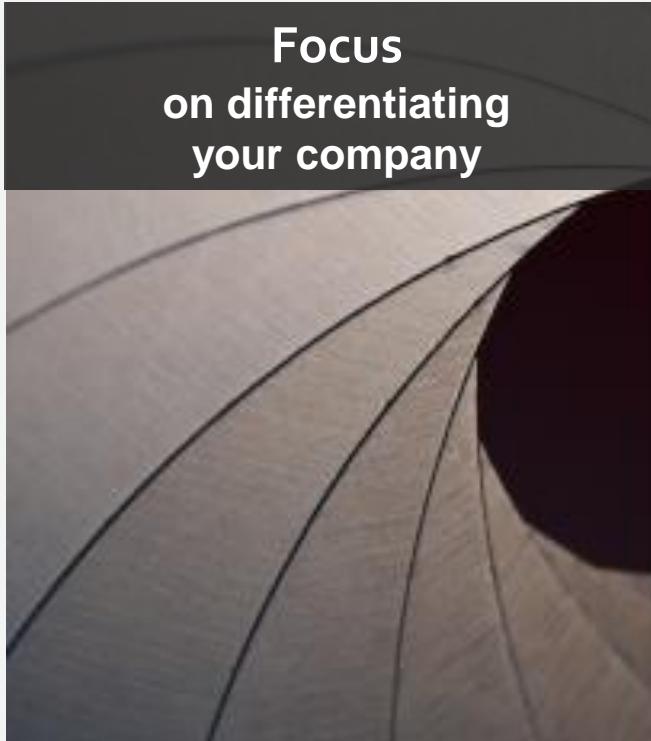
24 geographic regions, 76 availability zones



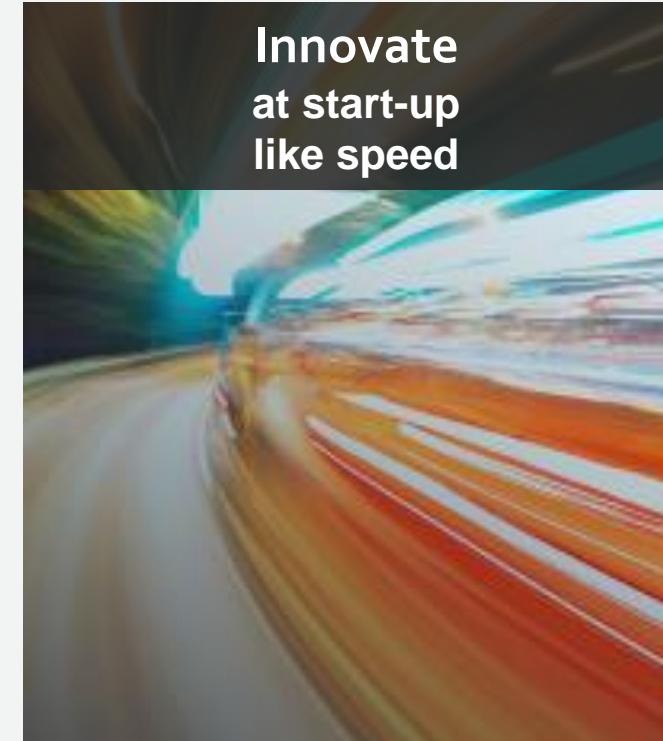
Near infinite IT resources available on demand

Benefits of the AWS cloud in automotive

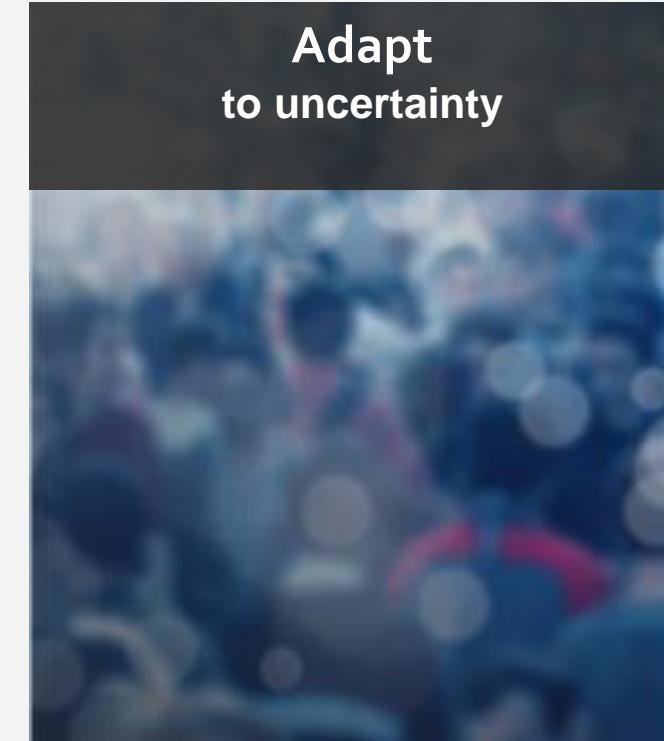
**Focus
on differentiating
your company**



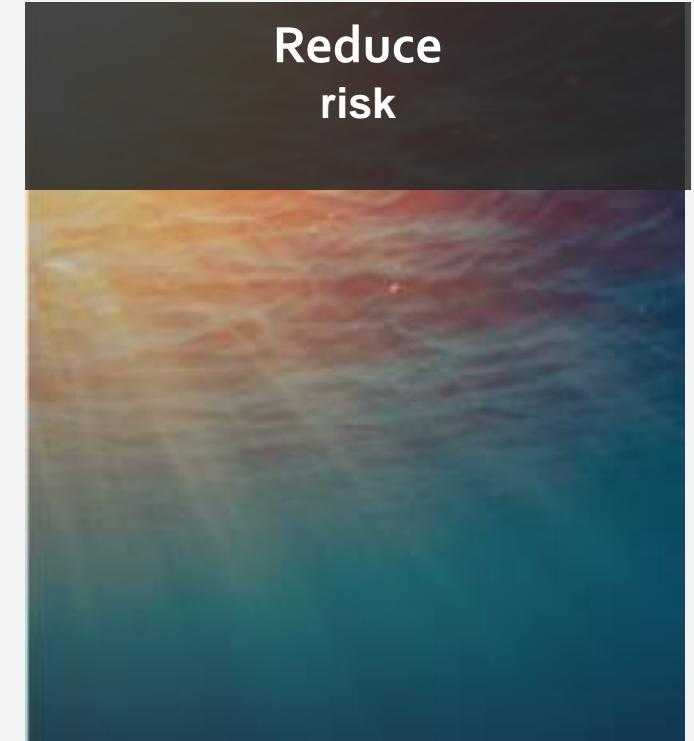
**Innovate
at start-up
like speed**



**Adapt
to uncertainty**



**Reduce
risk**



Eliminate technical debt and reallocate resources to focus on differentiating your brand experience rather than managing infrastructure

Apply the most advanced Machine Learning/AI, IoT, Edge computing, HPC and Analytics to develop, test and deploy innovative automotive applications

Virtually unlimited capacity and serverless, microservices architecture provide agility and scalability to respond quickly to market trends

AWS services have been designed to meet the requirements of the most security sensitive organizations and are constantly improving

AWS for automotive

Product solutions focused on end customer, Enterprise solutions for IT transformation

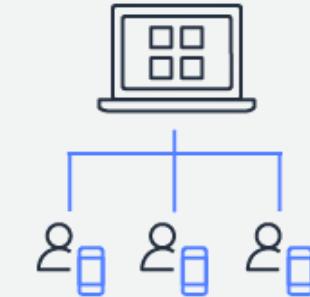
Product solutions



Connected Vehicle Cloud



Autonomous Driving Development

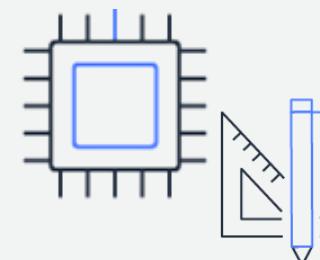


Digital Customer Engagement

Enterprise solutions



Big Data & Analytics

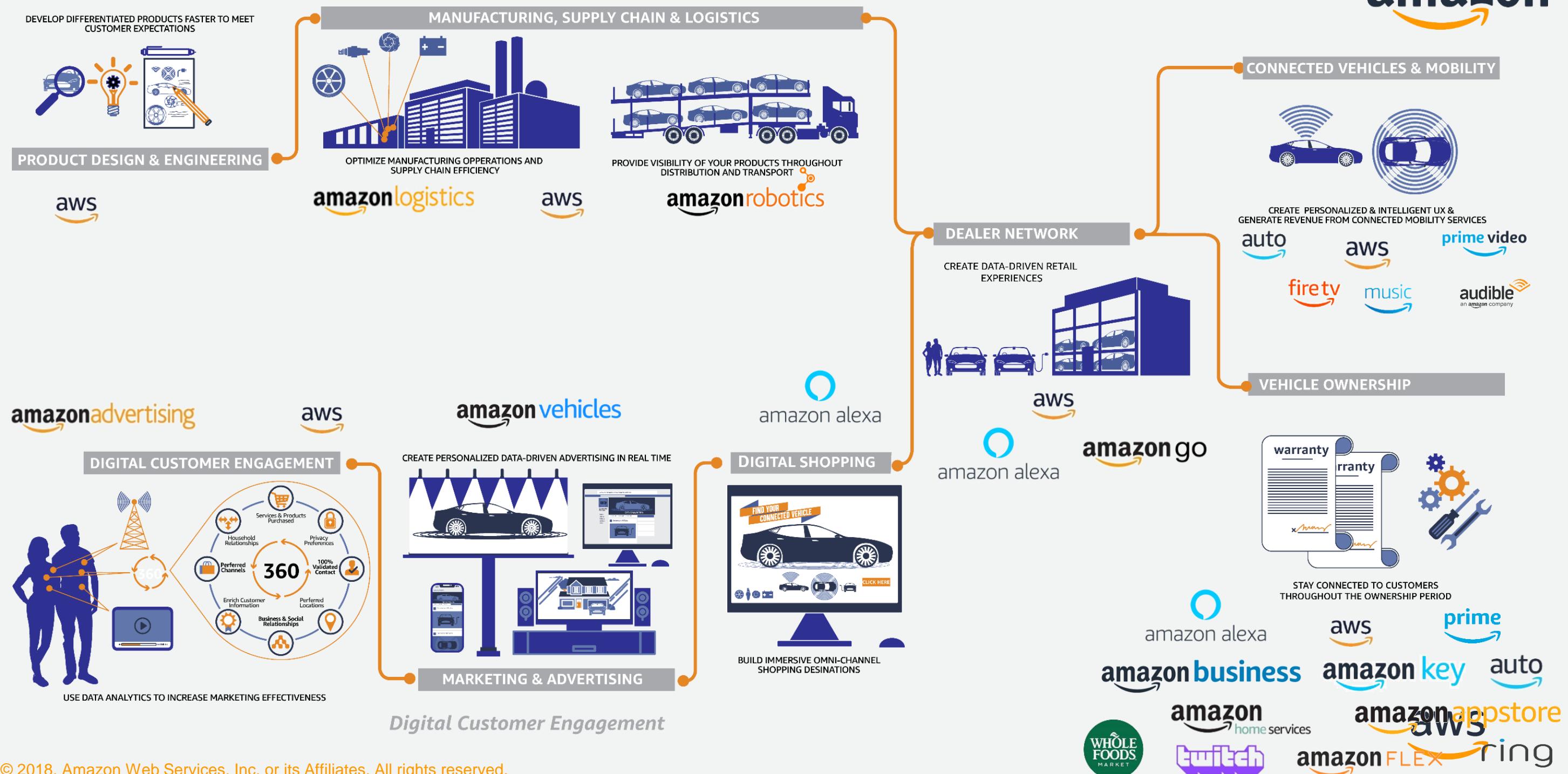


HPC for Product Design & Development



Enterprise Workloads

Amazon as a partner across the value chain



Delivering a new experience to Formula 1 Fans



“For our needs, AWS outperforms all other cloud providers, in speed, scalability, reliability, global reach, partner community, and breadth and depth of cloud services available.”
-Pete Samara, Director of Innovation & Digital Technology
Formula 1



Capture and process data for each car in every turn



Analyze data to create new metrics for fans and teams



Provide 500M fans insight into split-second strategies in real time

Accelerating Autonomous Vehicle Development



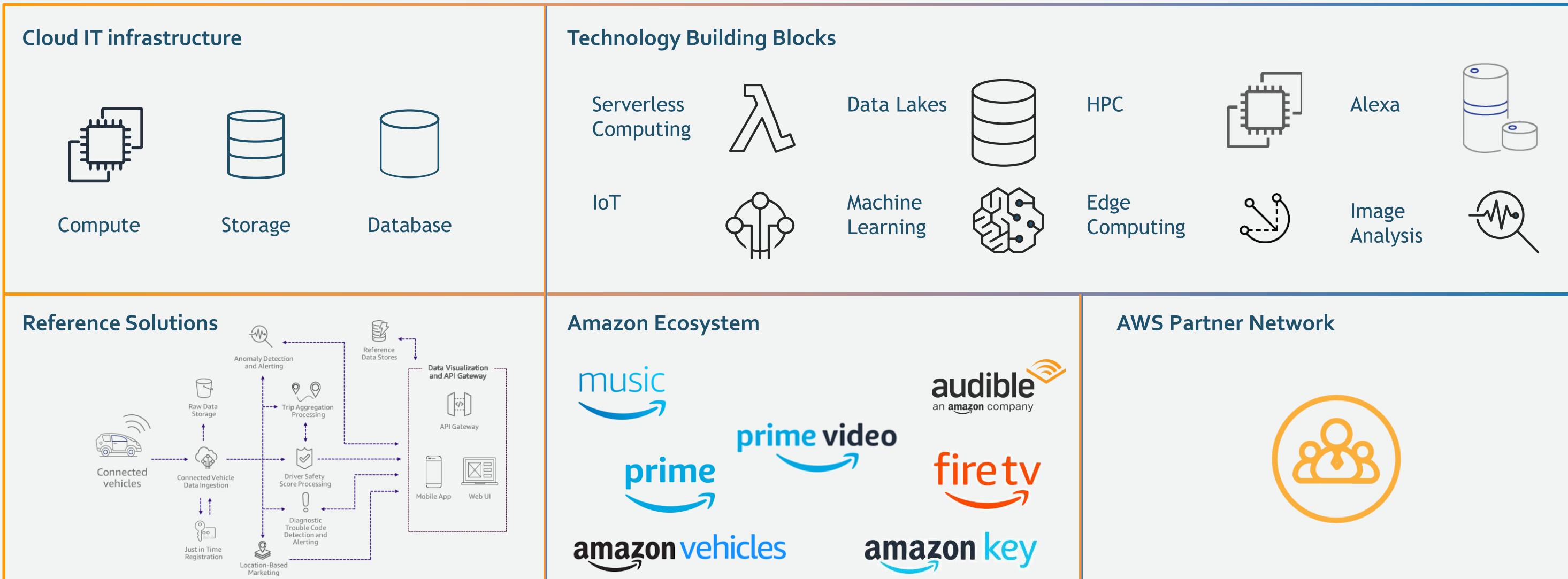
“AWS and its data transfer service is the perfect collaborator for us with near infinite compute and storage capabilities allowing us to test the widest range of simulated driving experiences. In our pursuit of autonomous driving perfection, we generated 20 million miles of testing and terabytes a day testing our software on AWS's platform to ensure our system makes the most informed and safest decisions possible while driving.”

- Dr. Xiaodi Hou, Co-founder and CTO, TuSimple



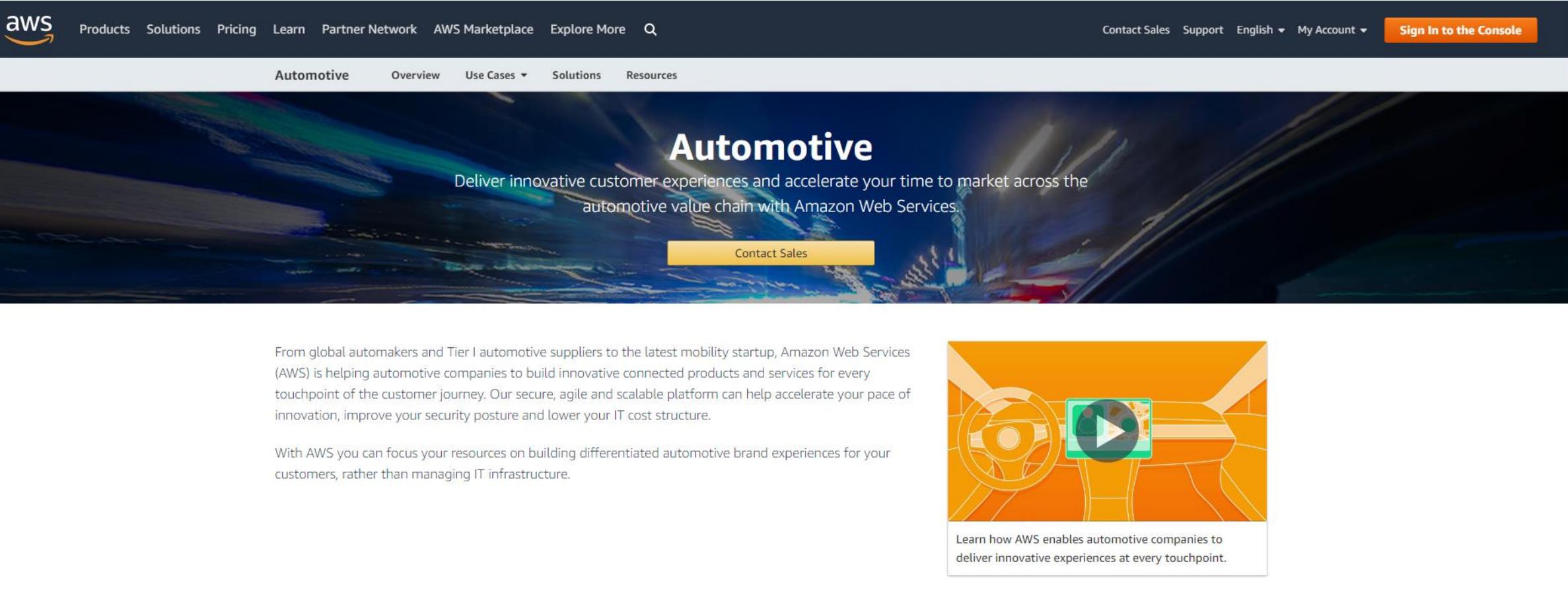
AWS for Automotive - Key enablers

AWS enables our customers to deliver intelligent, personalized brand experiences across the value chain



AWS for automotive

Automotive Web Portal



The screenshot shows the AWS Automotive landing page. At the top, there's a navigation bar with links for Products, Solutions, Pricing, Learn, Partner Network, AWS Marketplace, Explore More, and a search icon. On the right side of the bar are Contact Sales, Support, English, My Account, and a Sign In to the Console button. Below the navigation is a secondary header with links for Automotive, Overview, Use Cases, Solutions, and Resources. The main banner features a dark background with blurred blue and green streaks, the word "Automotive" in large white letters, and a subtitle: "Deliver innovative customer experiences and accelerate your time to market across the automotive value chain with Amazon Web Services." A yellow "Contact Sales" button is positioned below the subtitle. The main content area contains two columns of text and an image. The left column discusses how AWS helps automakers build innovative products and services across the customer journey. The right column highlights how AWS enables companies to deliver experiences at every touchpoint, featuring a play button icon over a map and steering wheel graphic.

From global automakers and Tier I automotive suppliers to the latest mobility startup, Amazon Web Services (AWS) is helping automotive companies to build innovative connected products and services for every touchpoint of the customer journey. Our secure, agile and scalable platform can help accelerate your pace of innovation, improve your security posture and lower your IT cost structure.

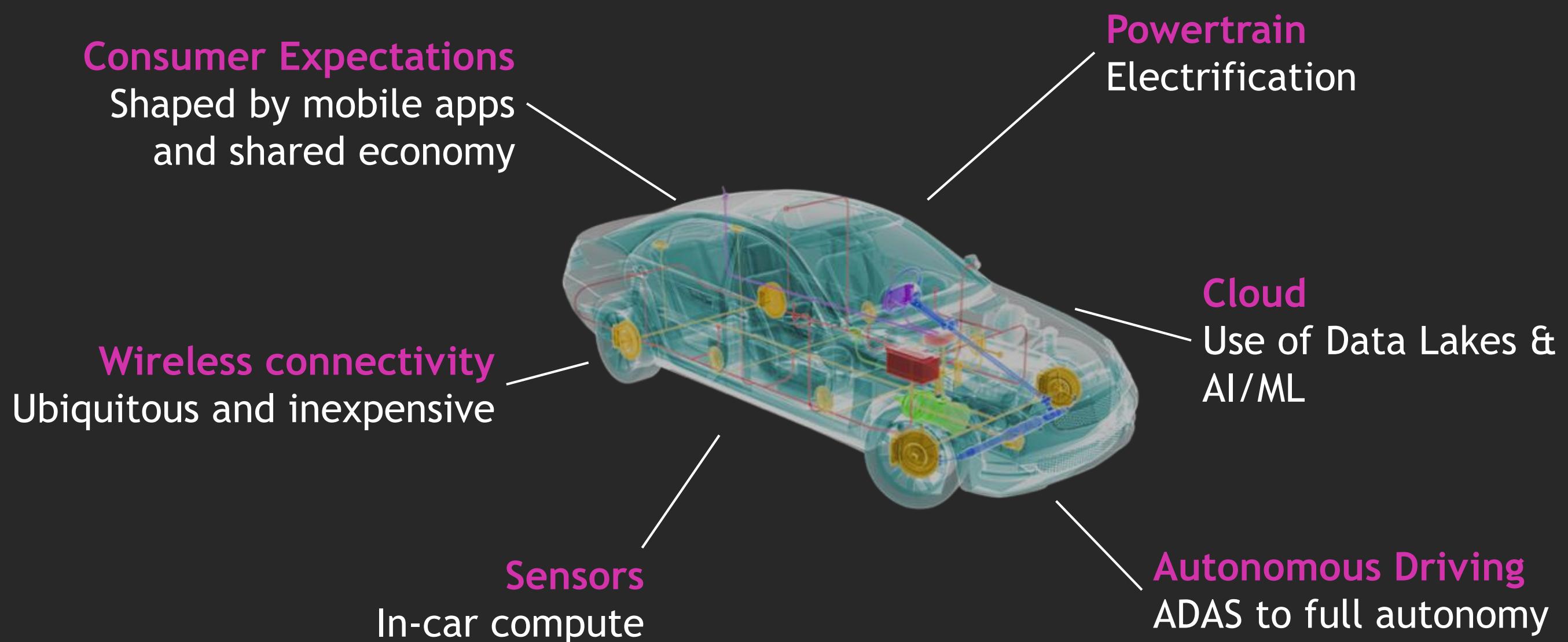
With AWS you can focus your resources on building differentiated automotive brand experiences for your customers, rather than managing IT infrastructure.

Learn how AWS enables automotive companies to deliver innovative experiences at every touchpoint.

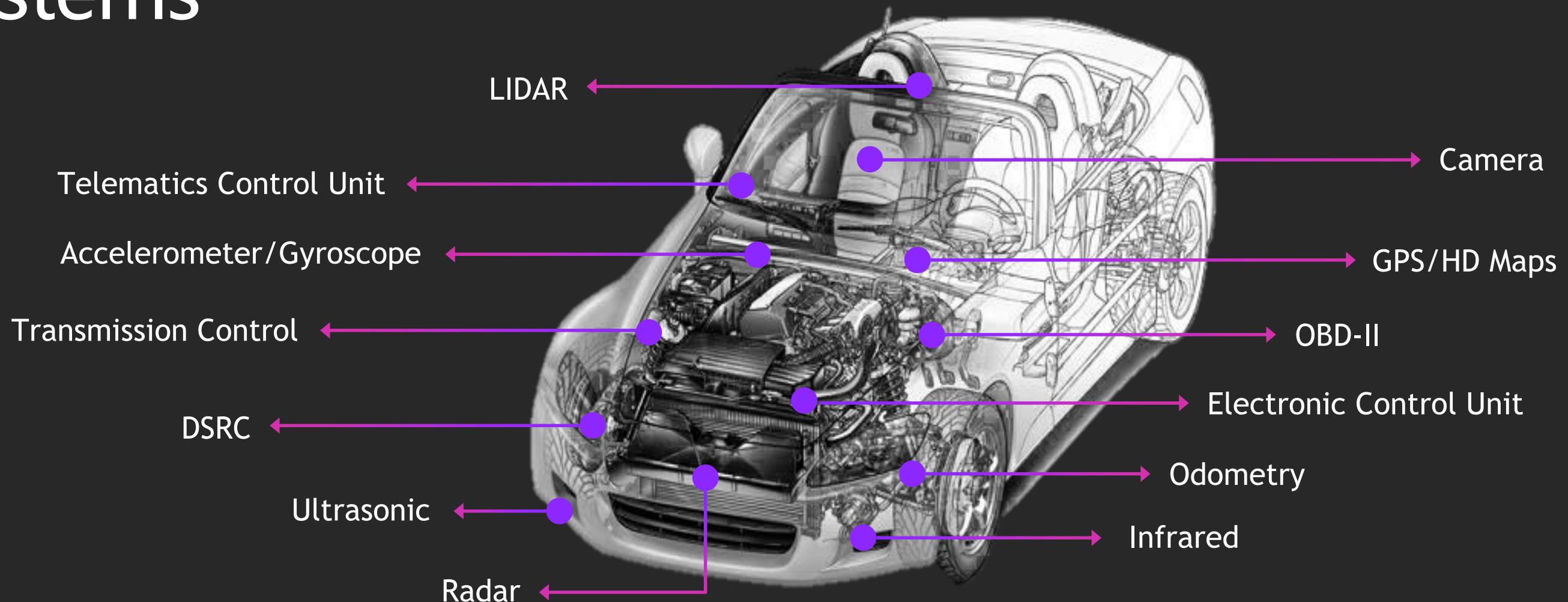
aws.amazon.com/automotive

Connected Vehicles

Megatrends driving the automotive industry

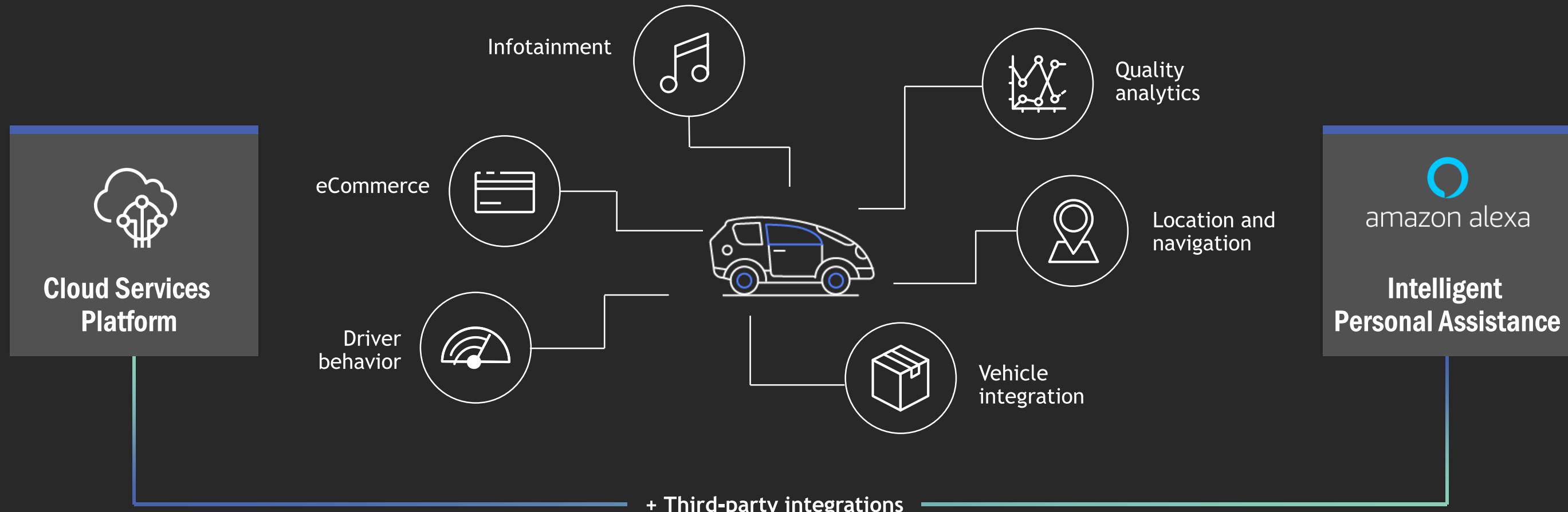


Vehicles are rolling sensor platforms that generate vast amounts of data from different systems



Amazon's approach to connected vehicles

A holistic view with a variety of services, products and features

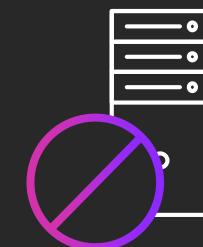


AWS Connected Vehicle Solution

AWS Connected Vehicle Solution benefits

Eliminate undifferentiated heavy lifting and focus on creating compelling connected vehicle services

Serverless



No servers to administer or patch

Managed



Flexible to capacity changes and requirements

Microservice-based

Scalable

Pay-as-you-go



Minimal up-front investment

Open source

AWS Connected Vehicle use cases

AWS Connected Vehicle Solution



Secure data
consumption



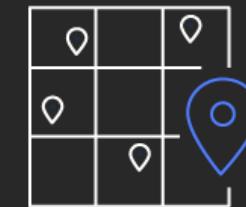
Driver
behavior



Anomaly
detection

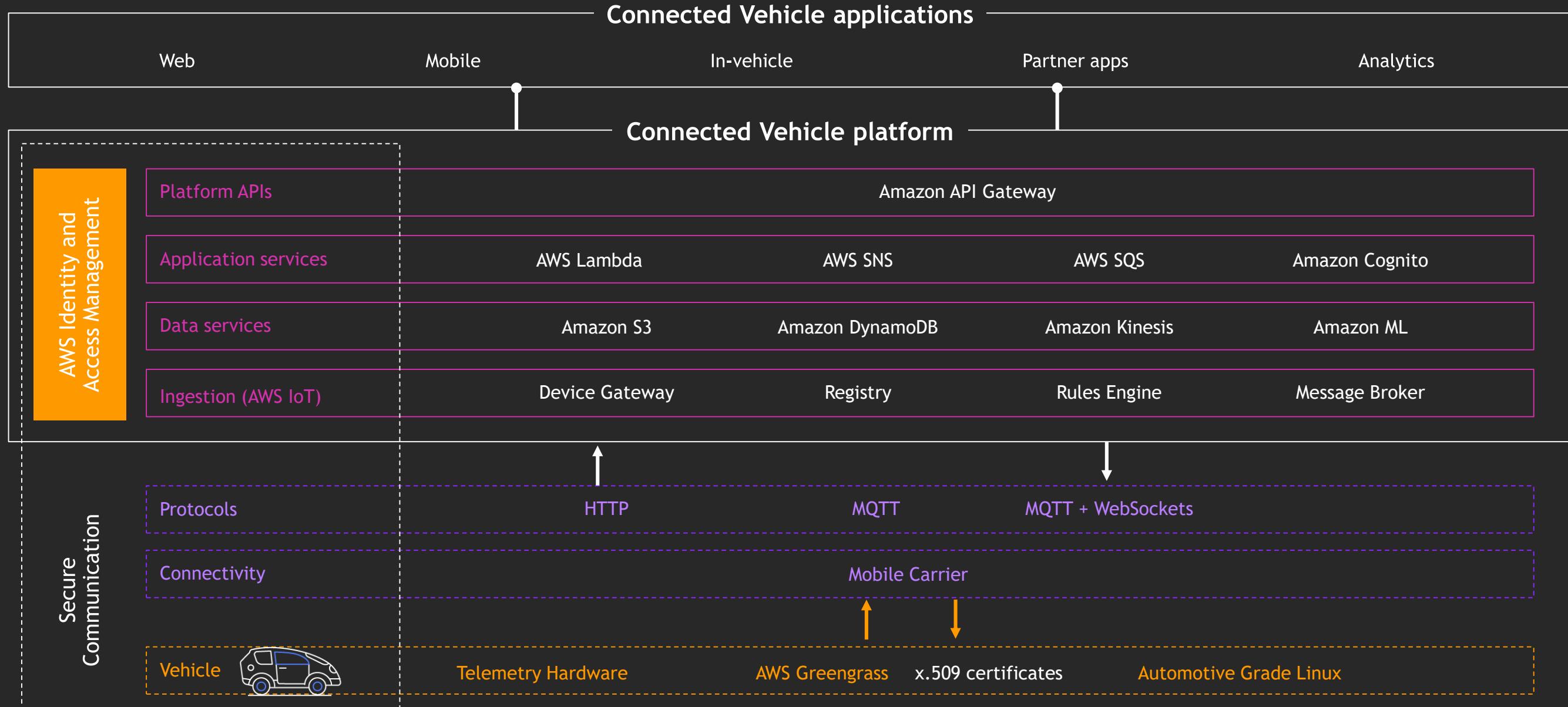


Diagnostics
alerts

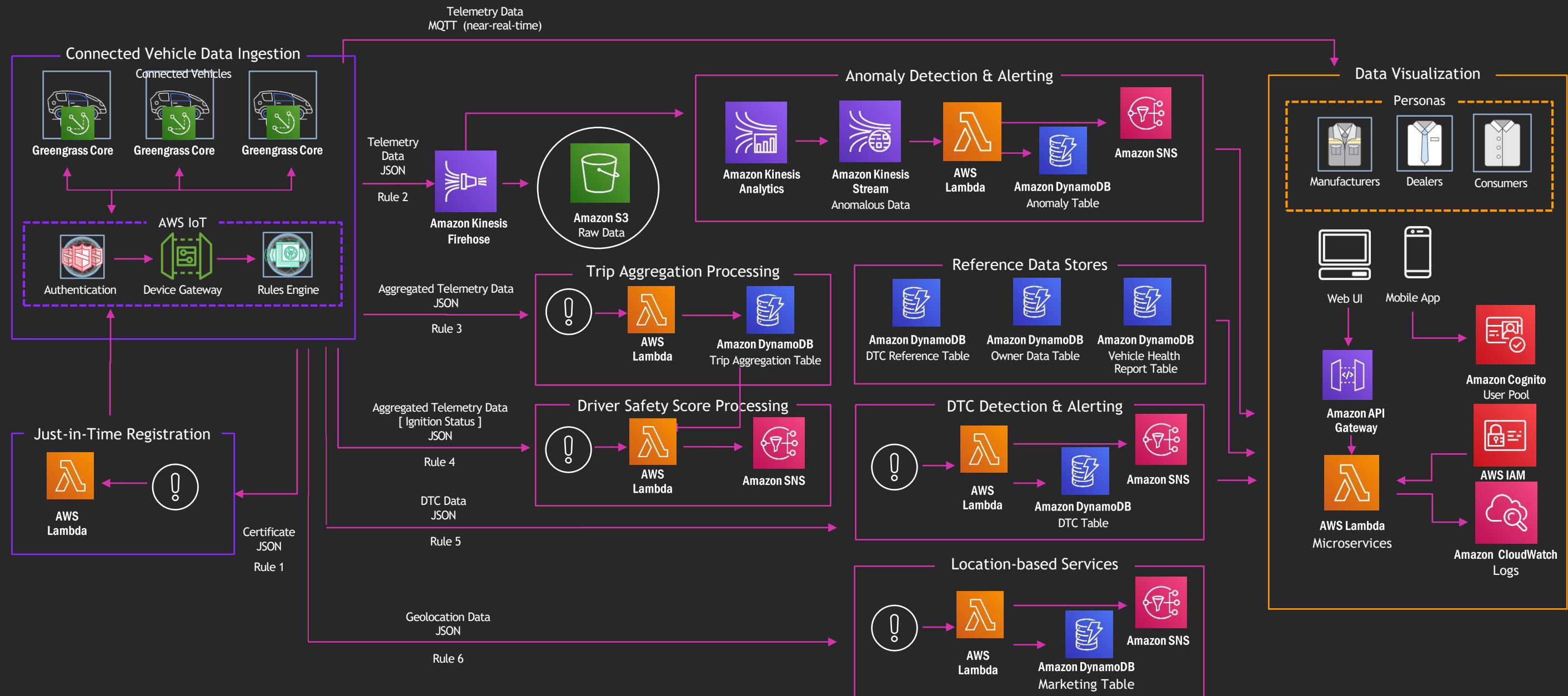


Location-
based services

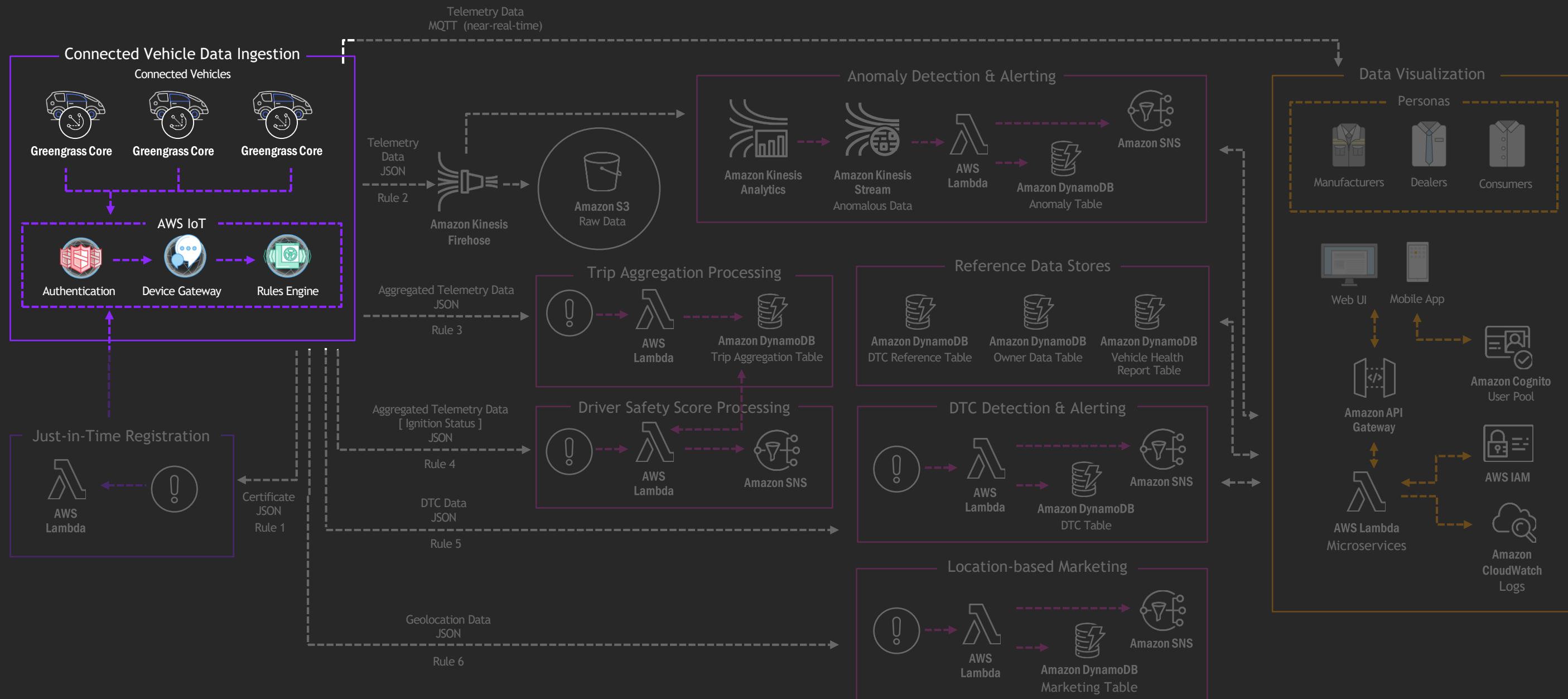
AWS Connected Vehicle Solution technology stack



AWS Connected Vehicle Solution reference architecture

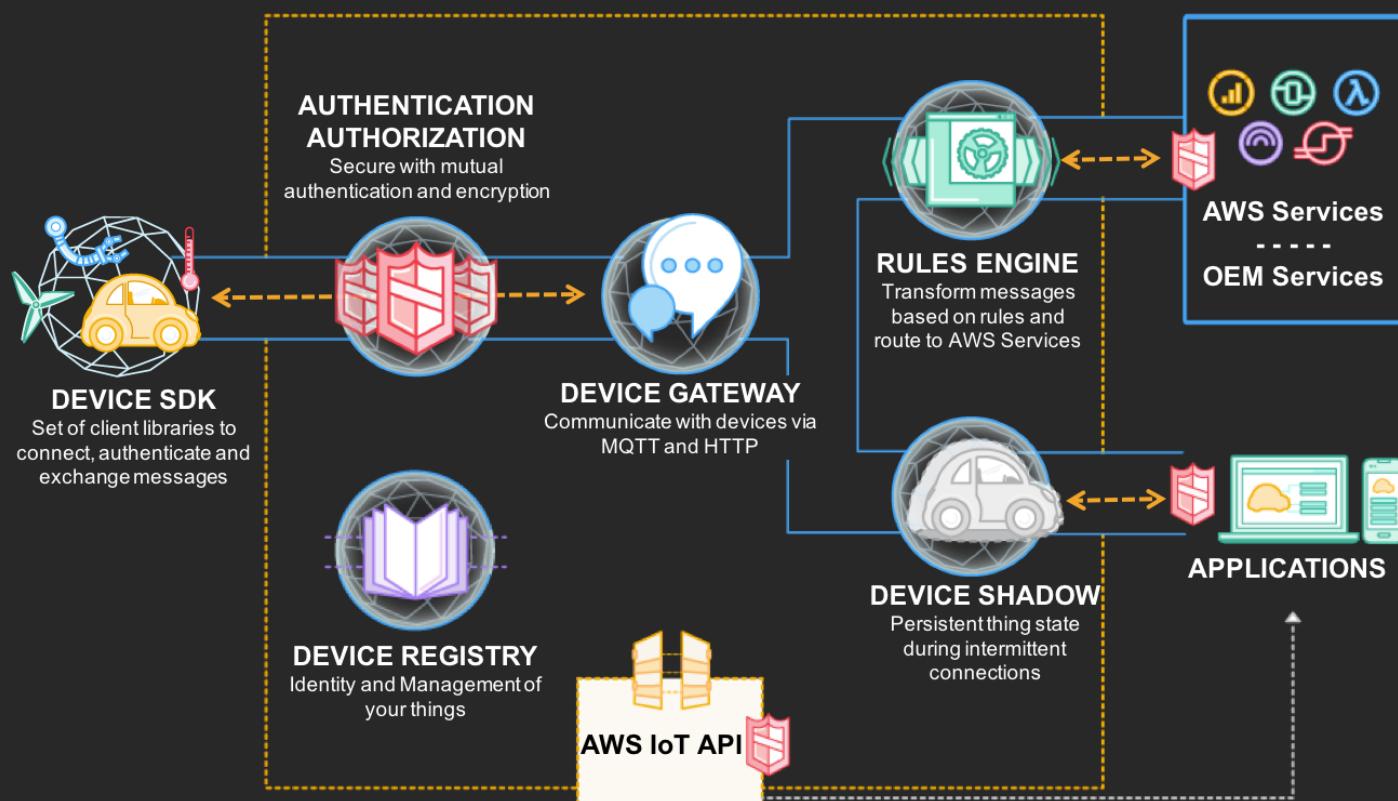


AWS Connected Vehicle Solution - Edge and IoT



Communicate with vehicles in a secure way

Connect to AWS Services, secure data and interactions, process and act upon connected vehicle data



Easily connect vehicles to the AWS Cloud

Secure vehicle connections and data

Process and act upon telemetry with easy rule engine

Tracks vehicle metadata such as attributes and capabilities

SDK to easily and quickly connect vehicles

Benefits of MQTT for connected vehicles

- Publish and subscribe
- One-to-many
- No polling required for clients
- Less power consumption
- Small message overhead
- Designed for “sometimes connected” devices



AWS Greengrass – Edge computing

Respond quickly to local events, operate with intermittent connections

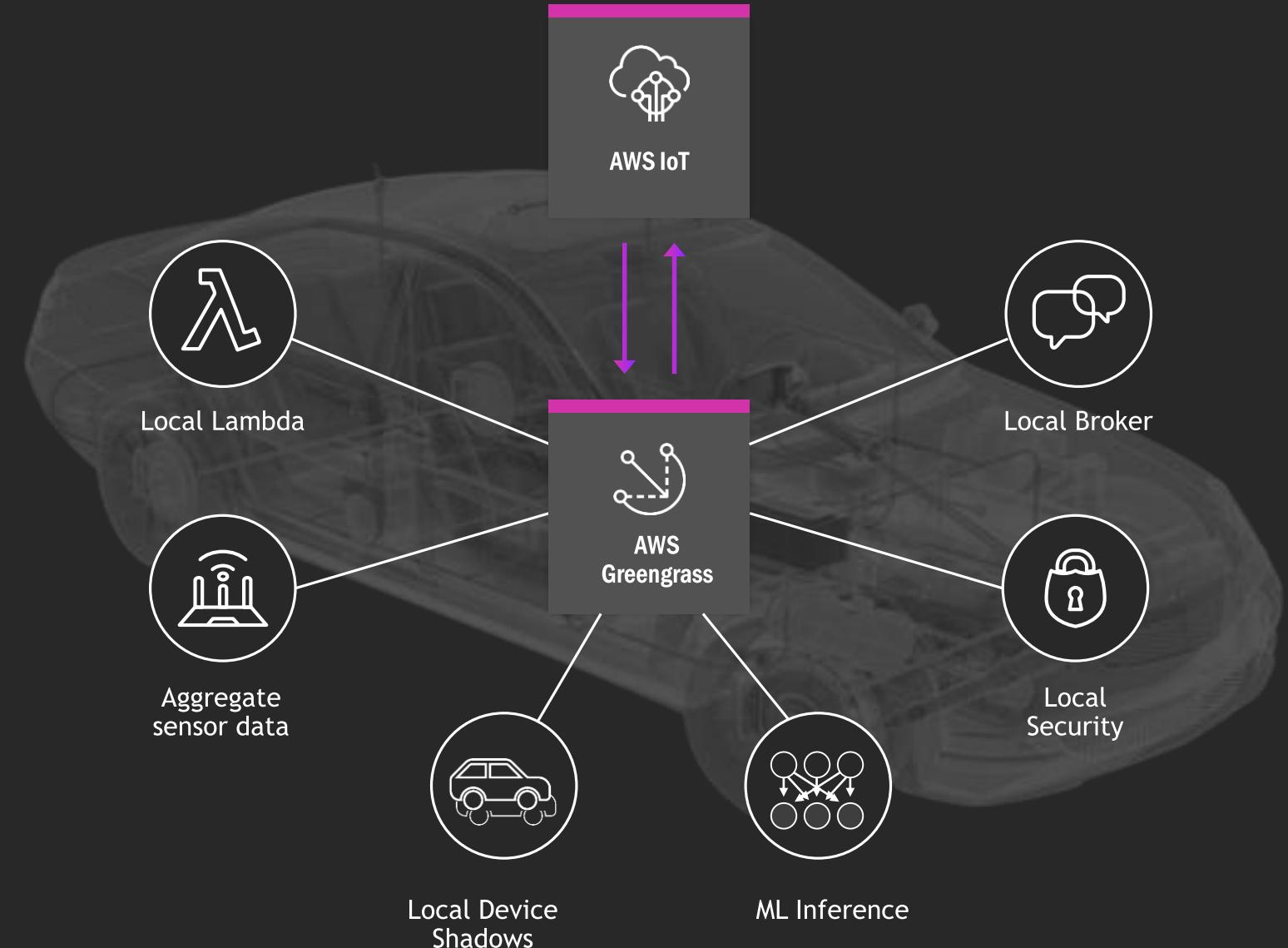
What is it?

Software that runs locally to extend the AWS cloud to the edge while securely synching with the cloud:

- Local computing with Lambda functions
- Machine Learning inferencing
- Local message broker
- Local device shadow
- Local security

Benefits:

- Operate offline
- Respond to latency-sensitive events quickly
- Run sophisticated AI/ML at the edge
- Local Data processing / filtering
- Automatic synch with the AWS Cloud
- Simplified device programming
- Java, Python, Node.js



Amazon FreeRTOS IoT operating system

Securely connect, program deploy and manage low power edge devices

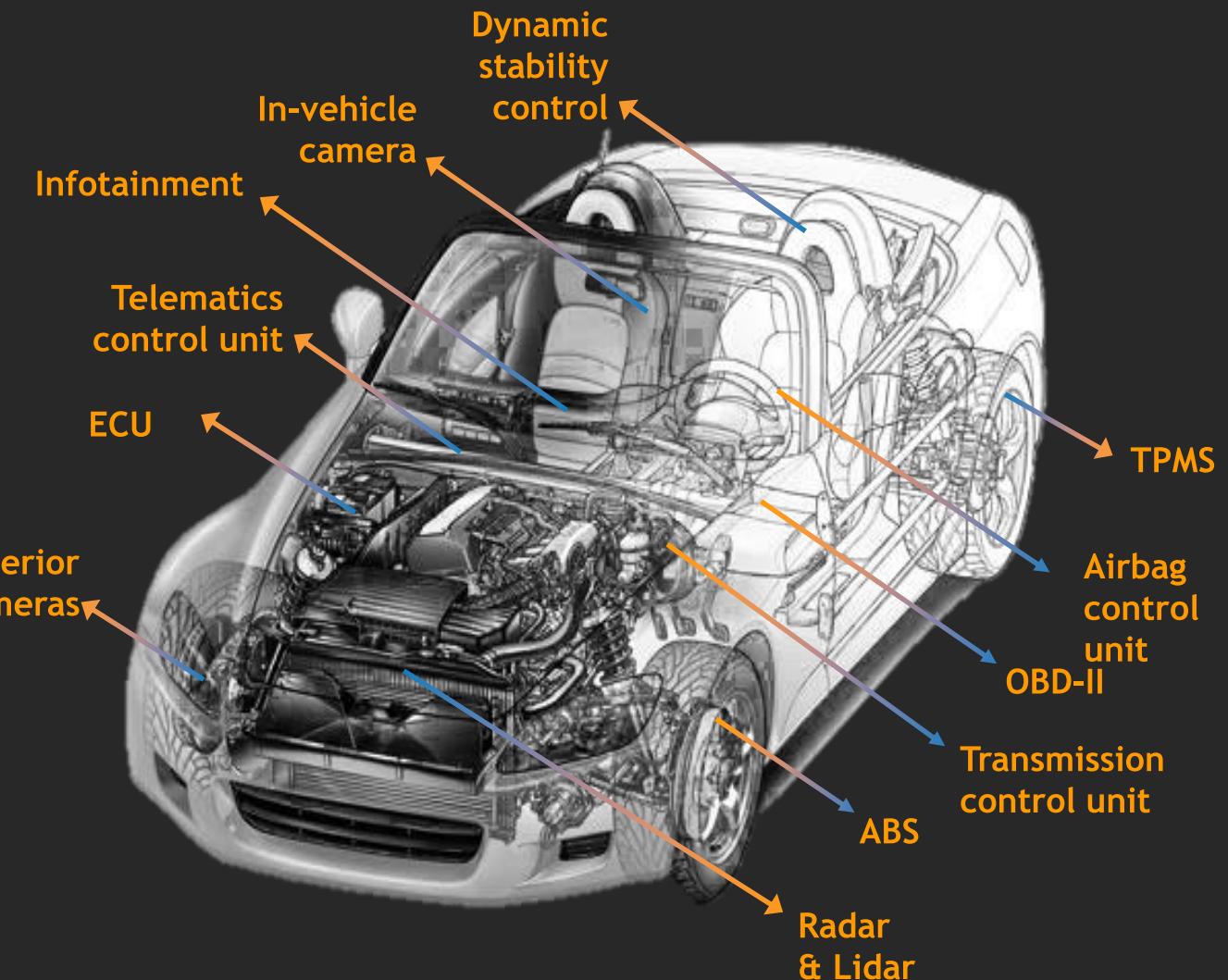
What is it?

An operating system for microcontrollers based on FreeRTOS
Kernel

- Open Source
- Libraries to program IoT capabilities like Wi-fi
- Libraries for data encryption and key management
- Direct connection to cloud services
- OTA update feature

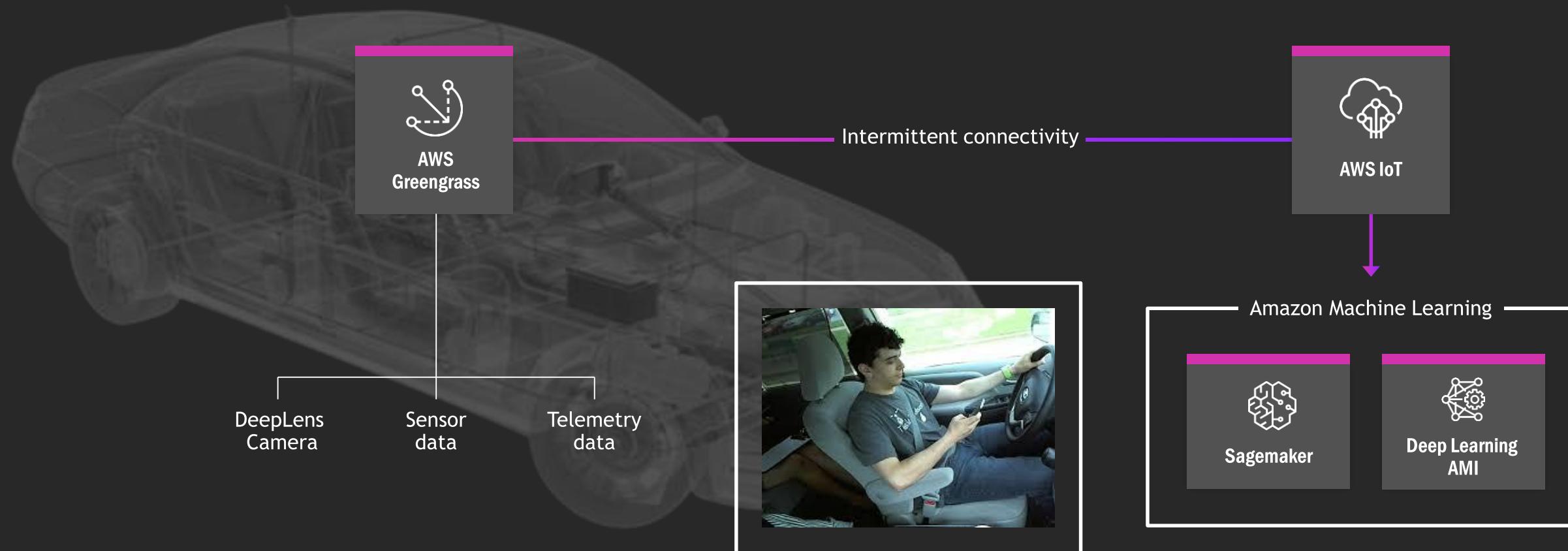
Benefits:

- Easily Program, Deploy, and Manage Low Power Connected Devices
- Connect directly to AWS IoT Core or AWS Greengrass
- Continue to communicate with local devices even without connection
- Secure Data and Device Connections
- Broad Hardware and Technology Ecosystem



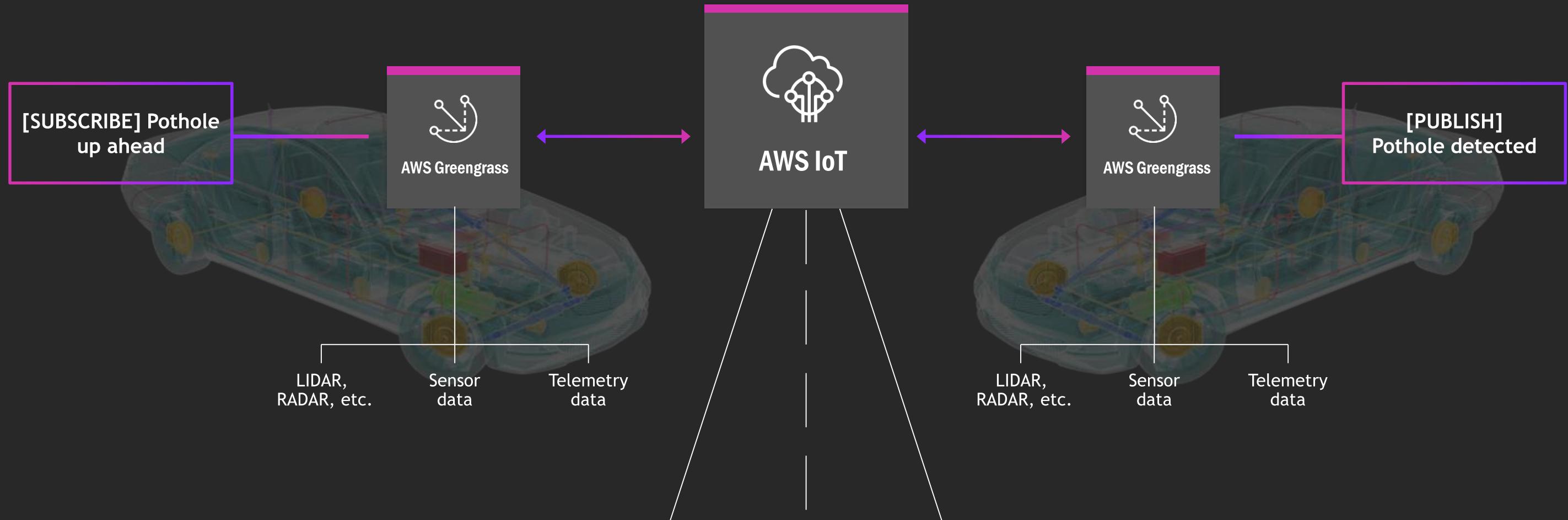
Examples – Distracted driver & traffic sign identification on AWS Greengrass ML Inference

Models were trained using Amazon SageMaker and AWS DeepLens



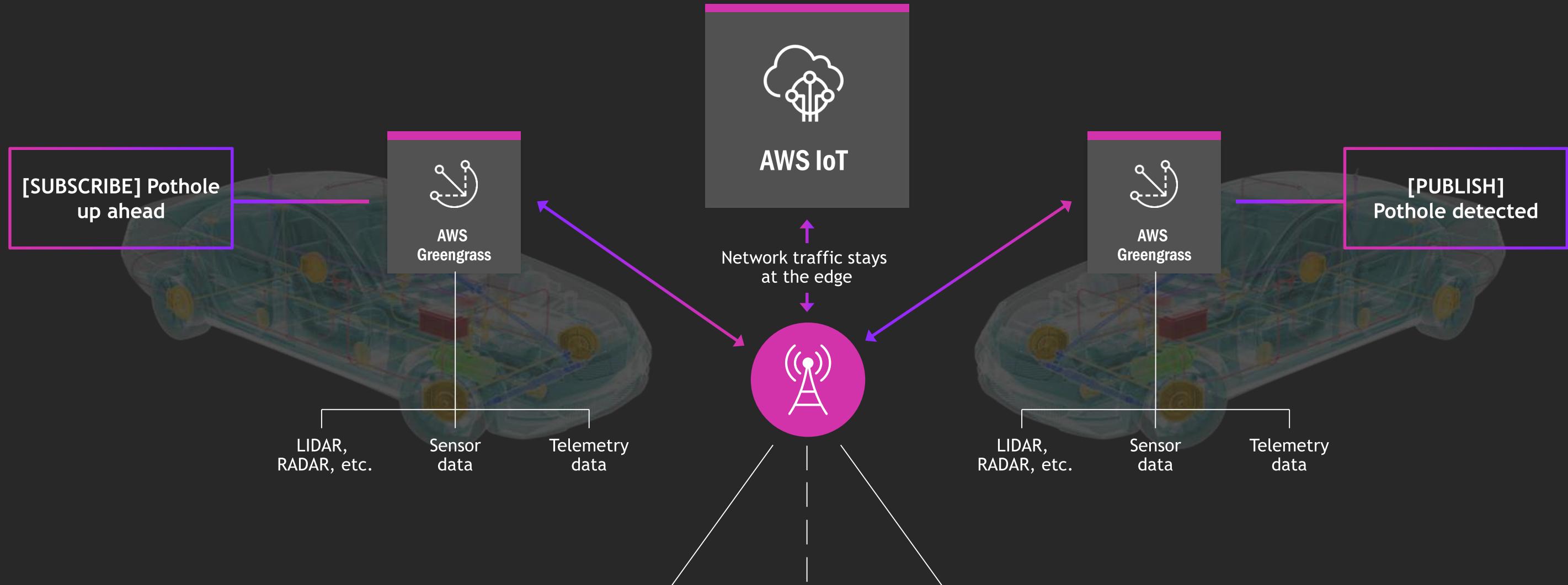
Enable vehicle-to-vehicle communication through the cloud

Share road conditions like accidents, potholes, black ice, and rain with other vehicles



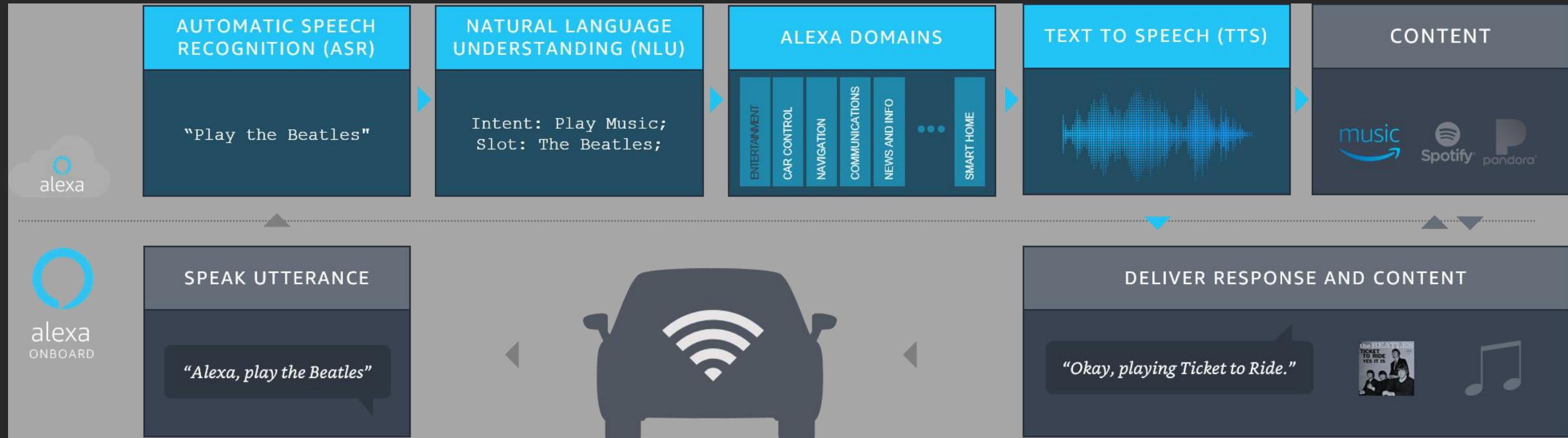
Multi-access edge computing and C-V2X

Sharing road conditions and safety events is faster due to local routing at the edge



Alexa Auto SDK

Alexa provides the voice-enabled front end complement AWS connected vehicle backend



Alexa Auto SDK Capabilities



Calling



Media streaming



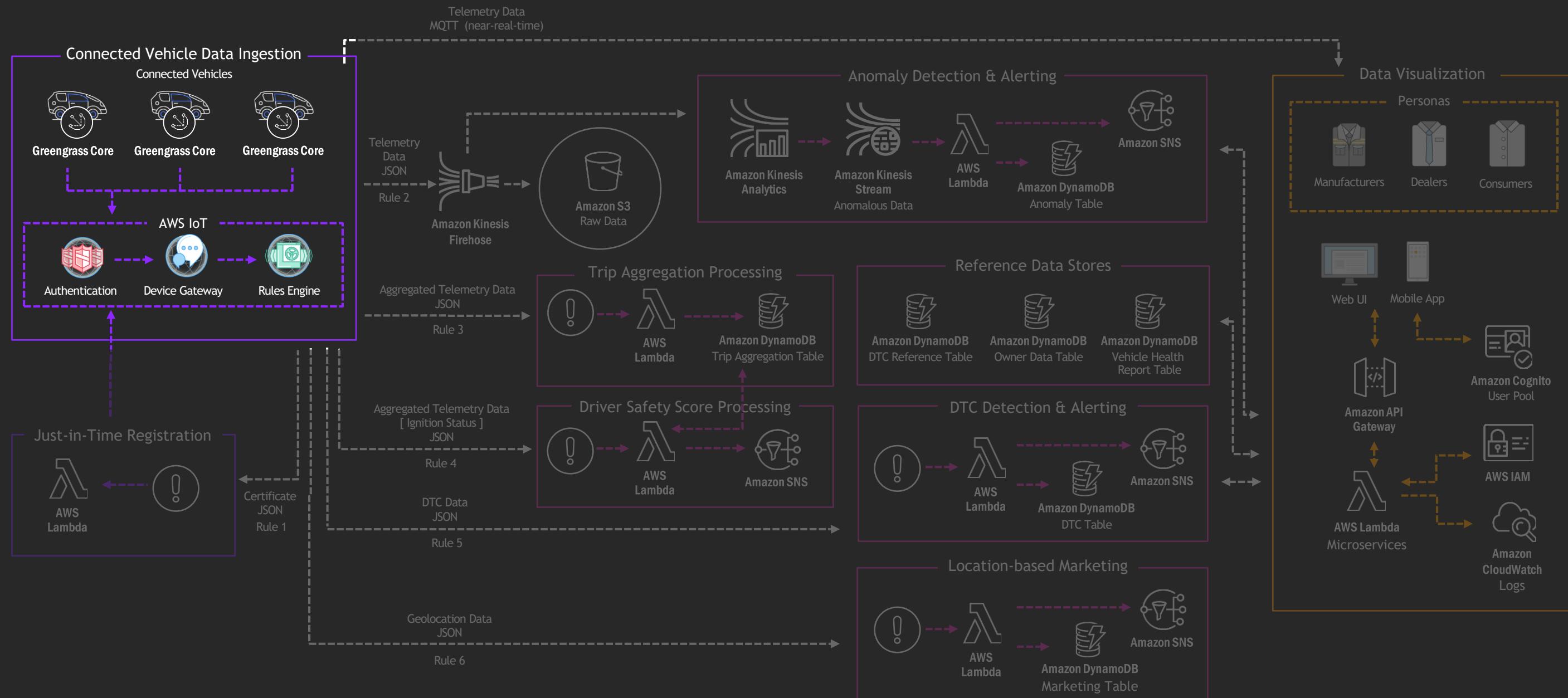
Navigation



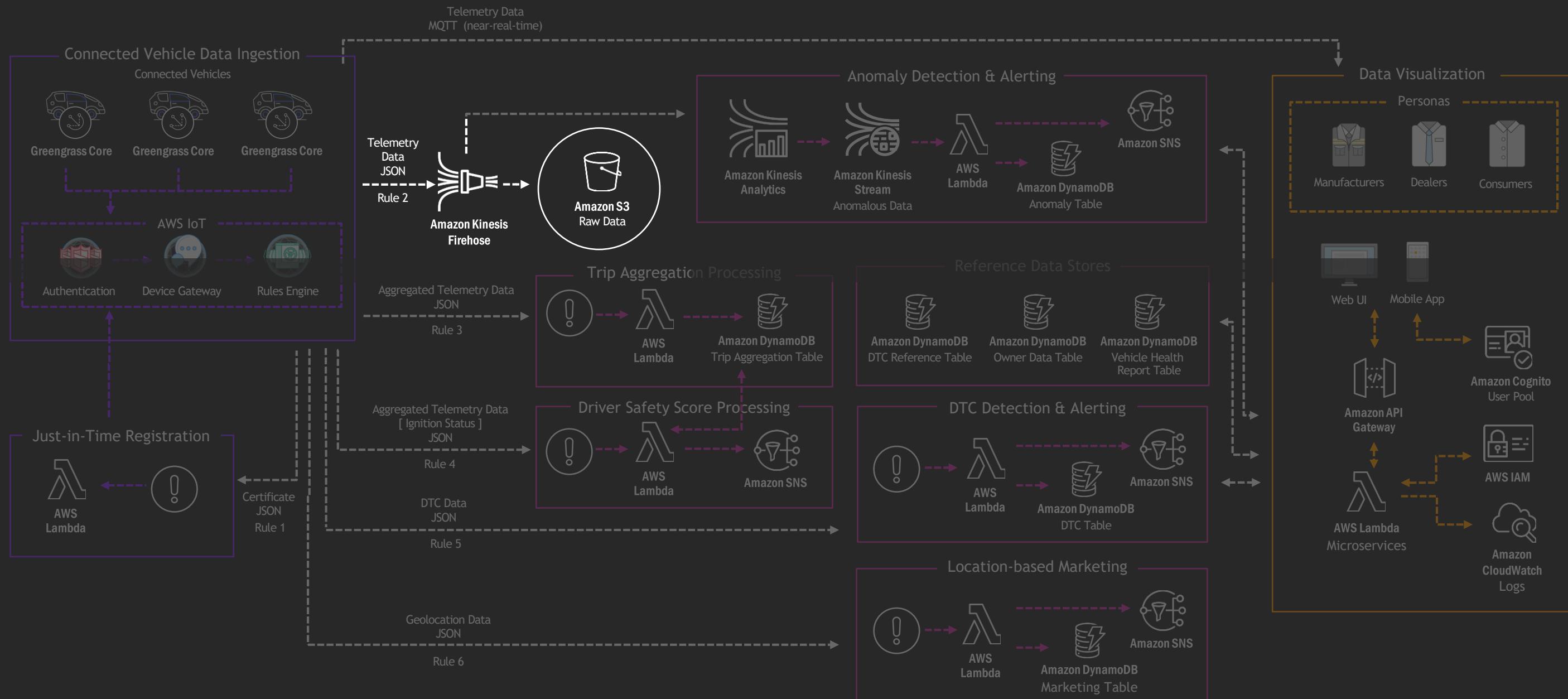
Local search



AWS IoT Device Simulator

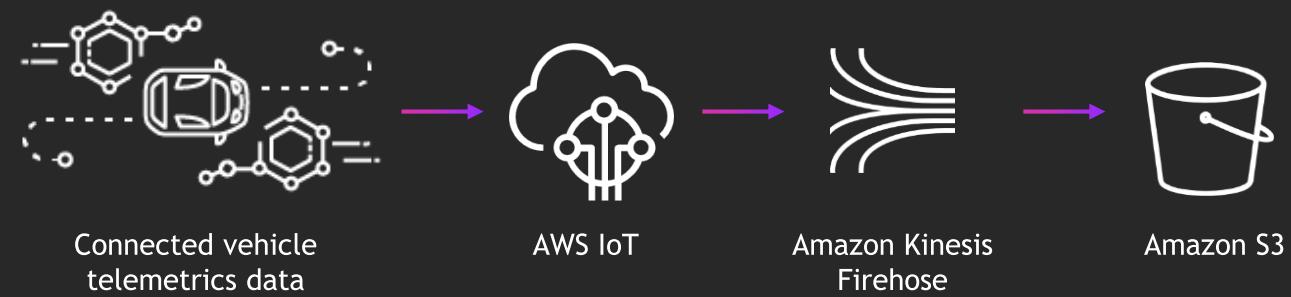


AWS Connected Vehicle Solution - Data ingestion



Securely store connected vehicle data at scale

Store and retrieve any amount of vehicle data with a simple web service interface



Deeply integrated with other AWS services

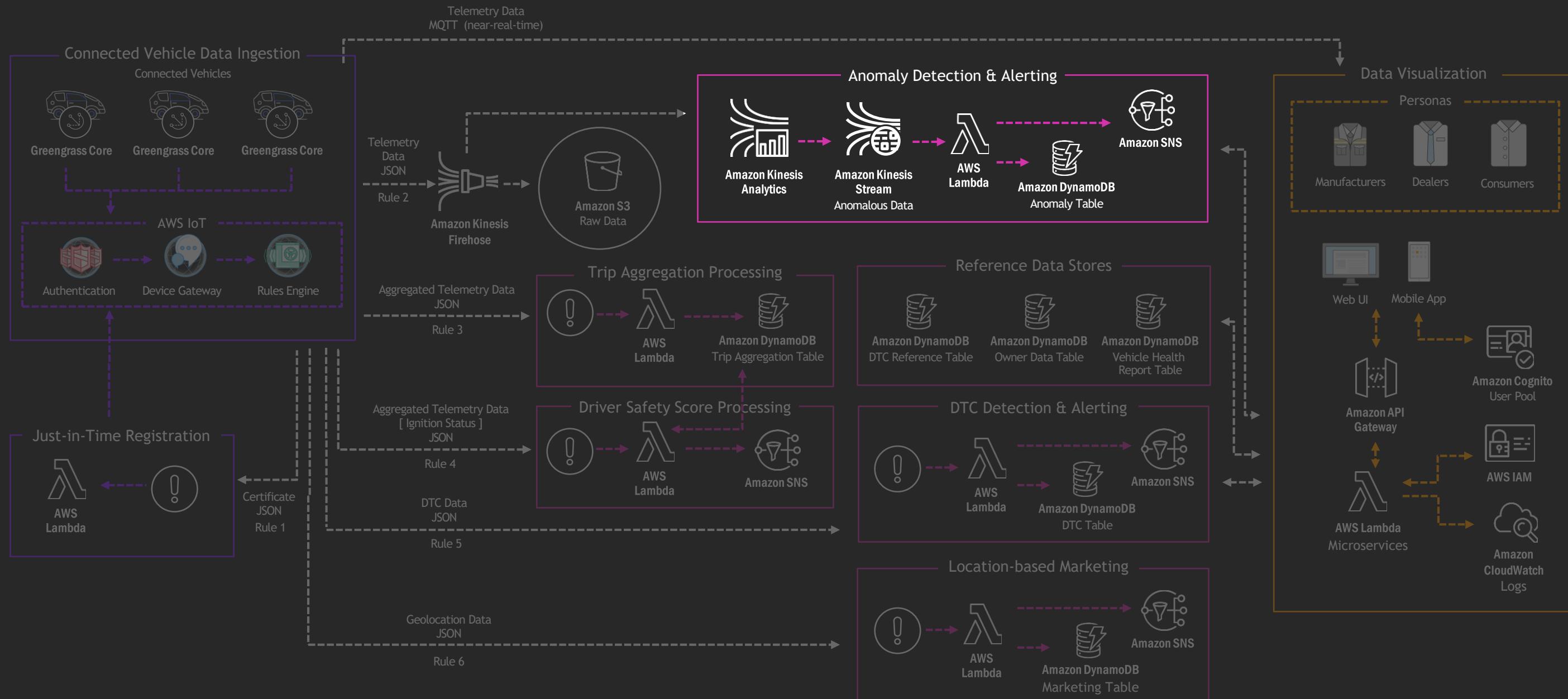
Secure vehicle data in flight and at rest

Store large amounts of vehicle data at a very low cost

Designed for up to 99.99% availability

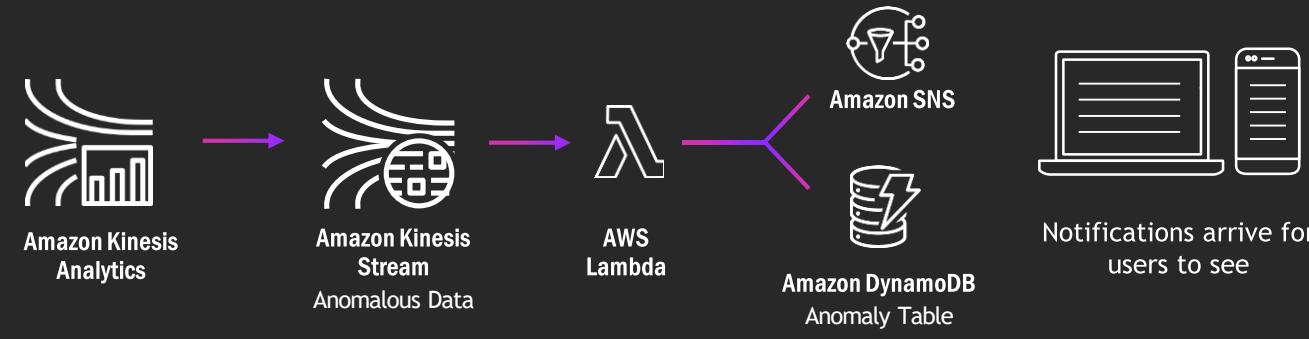
Designed for durability of 99.999999999%

AWS Connected Vehicle Solution—Anomaly detection



Act on connected vehicle information as it happens

Capture, store, and analyze streaming connected vehicle telemetry data



Quickly load TBs per hour of streaming data

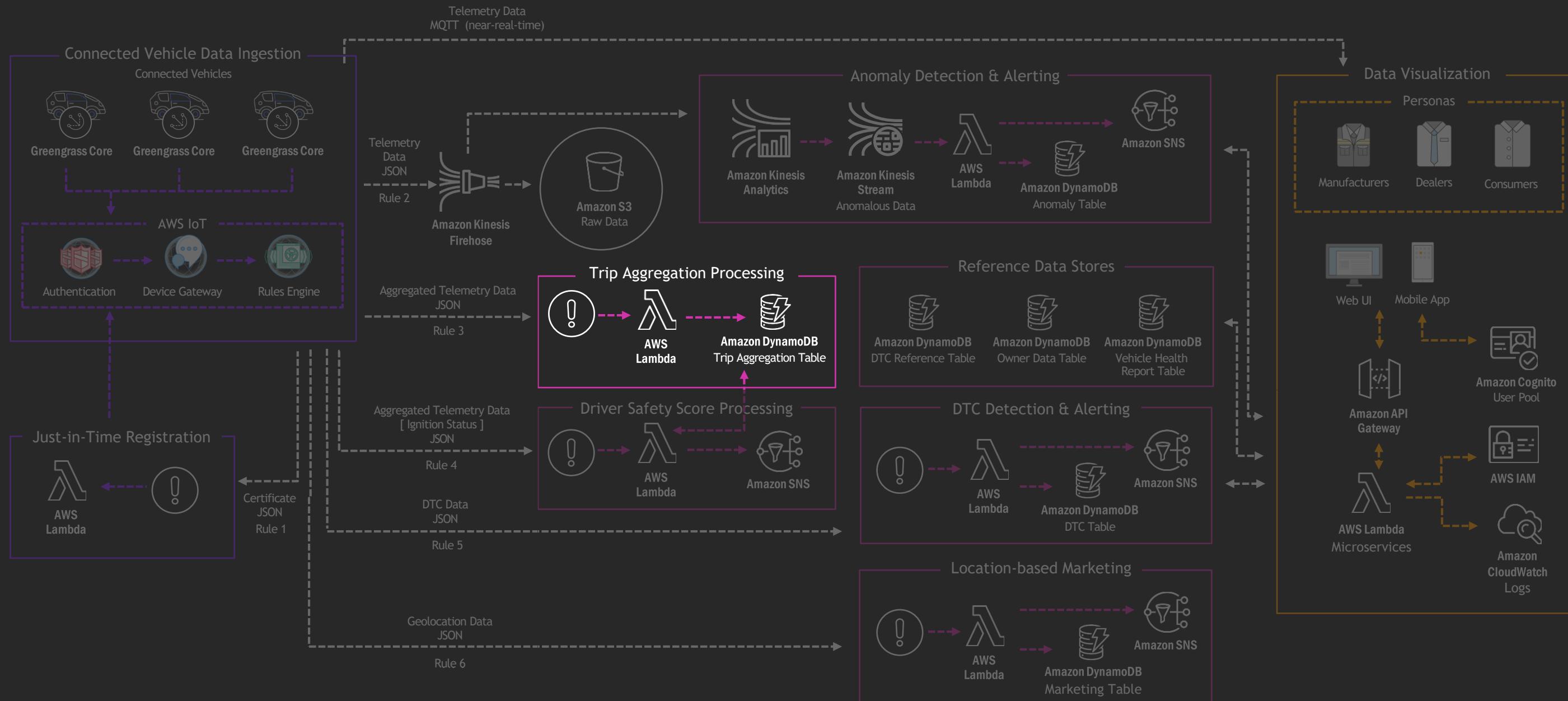
Perform real-time analytics on streaming vehicle data

Leverage multi-stage processing using specialized algorithms

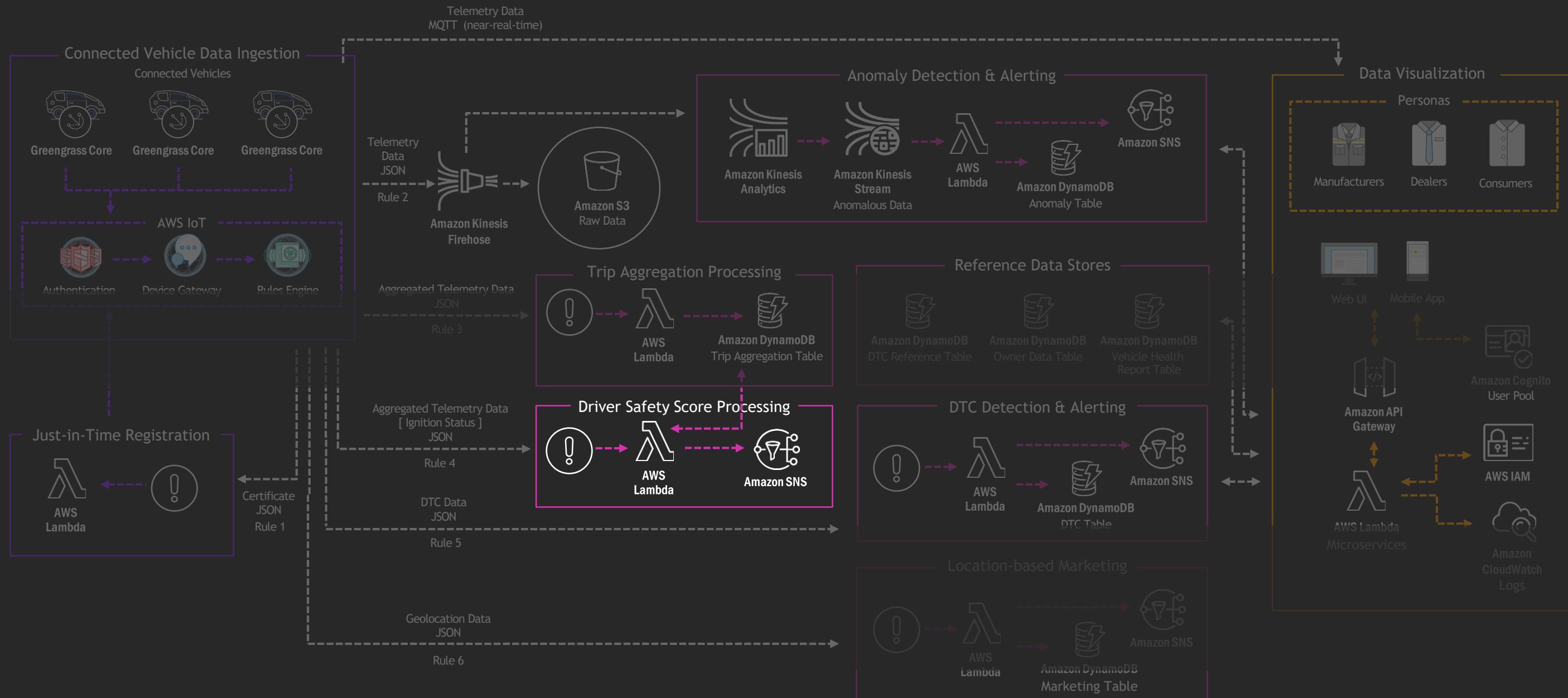
Durable temporary storage for data in transit

Custom stream partitioning for finer control over scaling

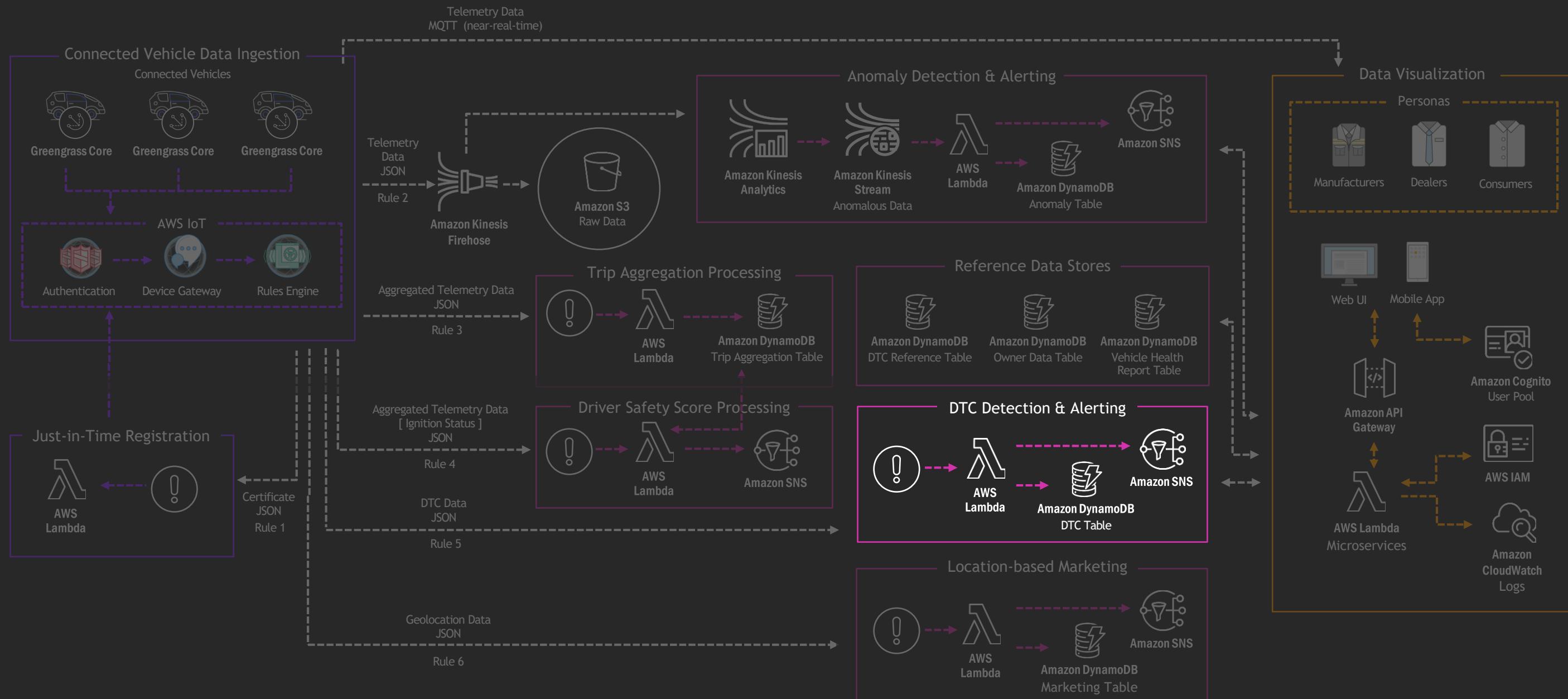
AWS Connected Vehicle Solution - Trip aggregation



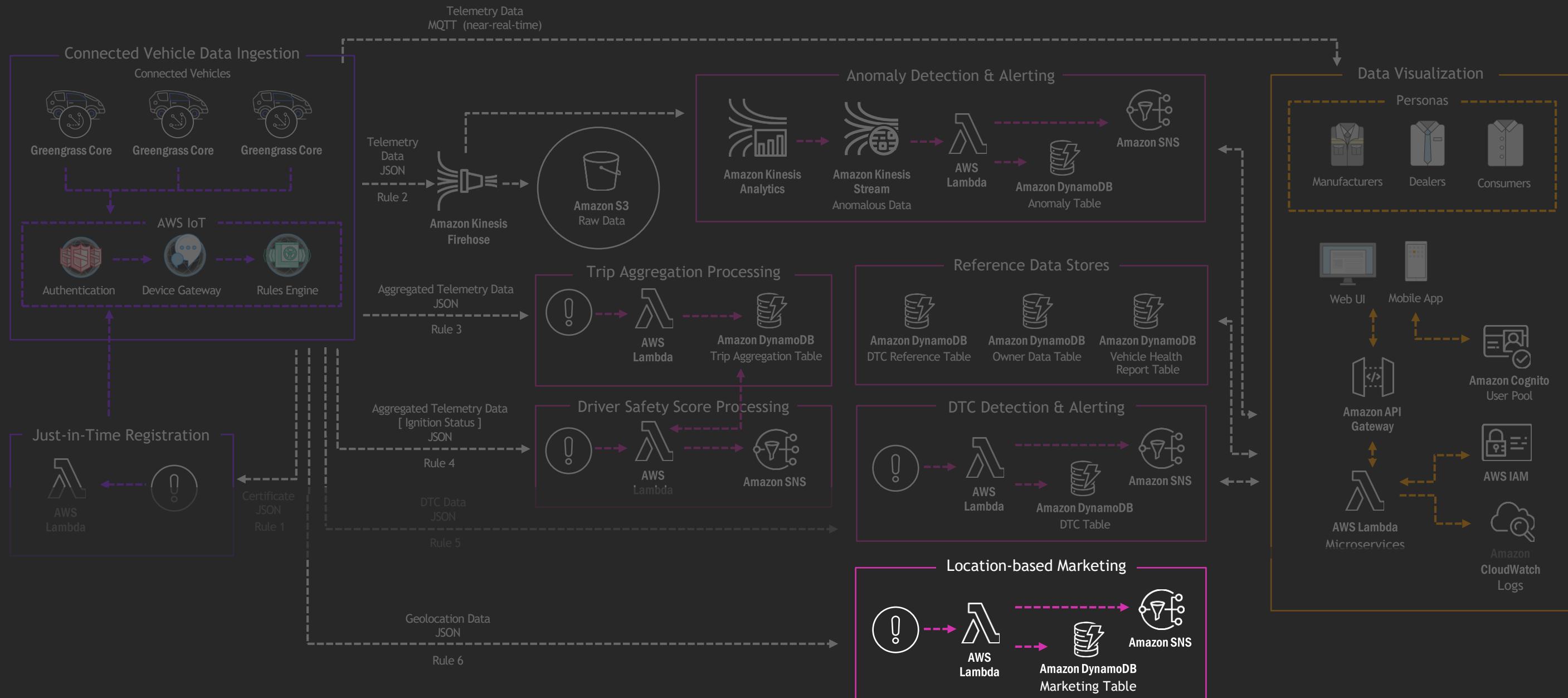
AWS Connected Vehicle Solution - Driver safety scoring



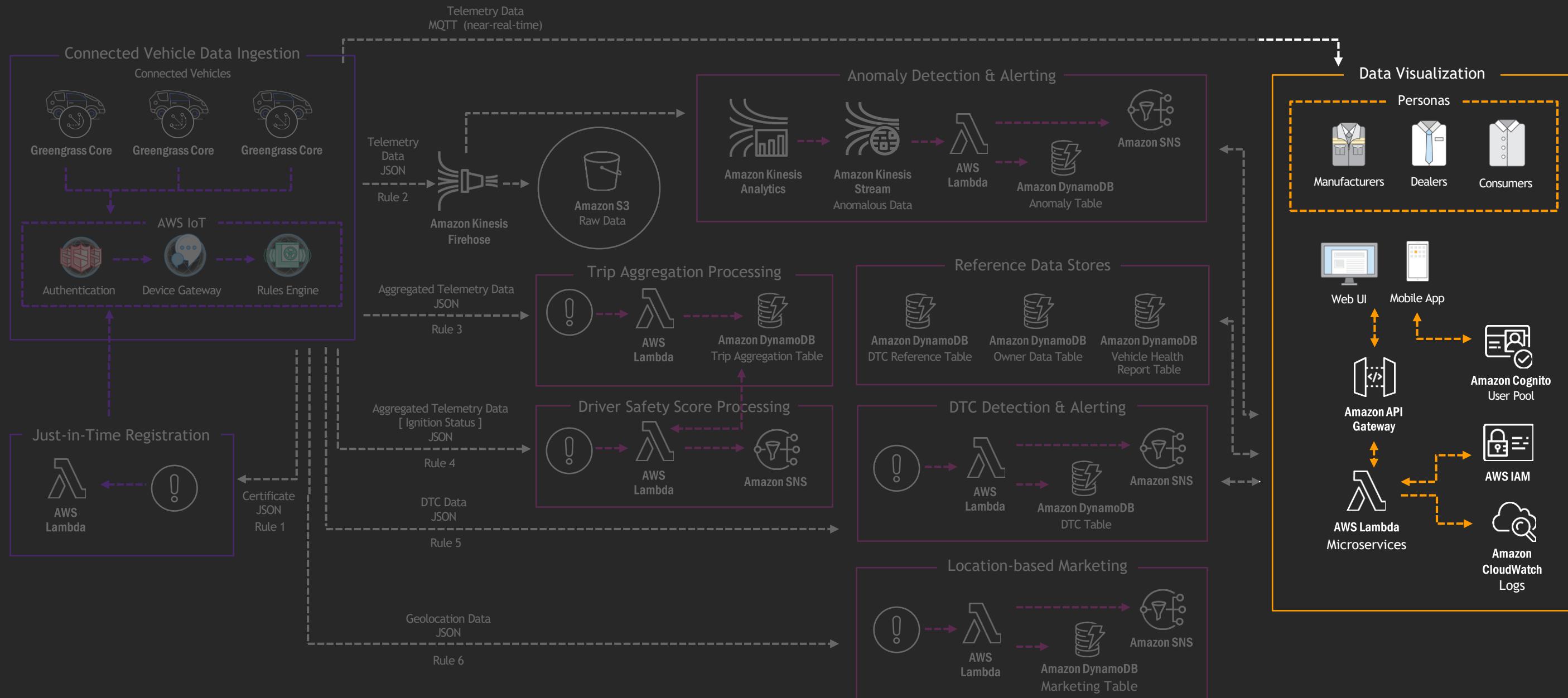
AWS Connected Vehicle Solution - DTC detection



AWS Connected Vehicle Solution - Location-based Services



AWS Connected Vehicle Solution - APIs for applications



Demo

1. IoT Device Simulator
2. Looking at IoT Rules
3. Data pipeline - Kinesis Firehose -> S3
4. Athena to query the data
5. Quicksight to view the data

Device Shadow

Understand and control the status
of your device at any time

Reporting the last known state of the device;
e.g., the last known color of the light bulb is red

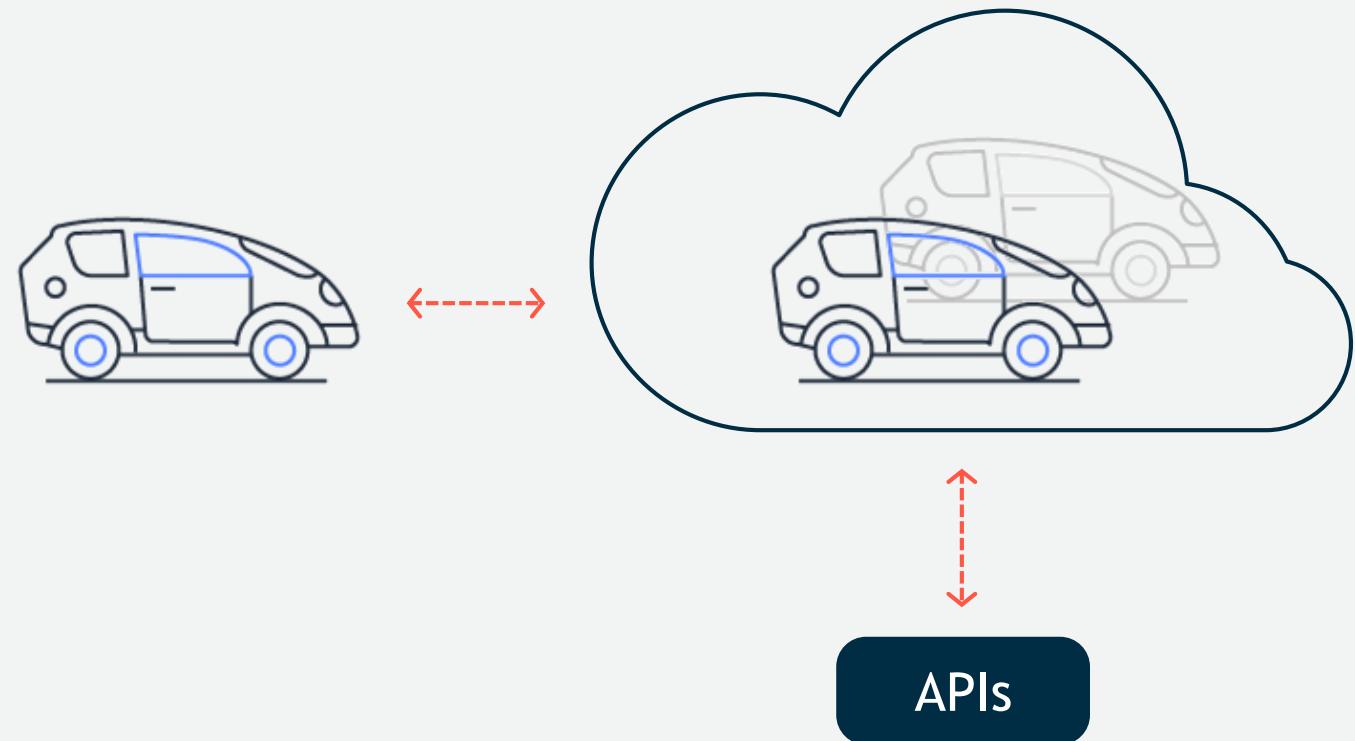
Changing the state of the device; e.g., change
the color of the light bulb to blue

Real time notification of state changes
using MQTT

Asynchronous communication with
offline devices

Device SDK integration for easy
implementation on devices

REST APIs for applications to interact
with devices



Demo – Device Shadow

1. Device Digital Model
2. Update the Shadow
3. The Device state is updated in real time (using MQTT/Websocket protocol)

Reference material

1. [AWS Connected Vehicle Solution](#) and Deployment guide
2. [AWS IoT Device Simulator](#) and Deployment guide
3. [AWS Re:Invent 2019 Videos and contents for Automotive](#)
4. [AWS for Automotive](#)
5. AWS Labs - [Track and Trace Vehicles](#)

Q&A

About AWS Automotive

Auto industry expertise

- 100%** Top 10 global OEMs AND Tier I suppliers use AWS for meaningful connected, autonomous, or customer engagement workloads
- #1** Ranking in ABI Research's Connected Car Cloud Platform
- 15M+** Vehicles forecasted to be connected in 2020 on AWS
- 23+** Years, on average, AWS Automotive team leaders have been in the industry

Select AWS automotive customers:

VOLKSWAGEN
GROUP

BMW
GROUP



Uber

lyft

avis budget group

TURO

Careem

Grab

Ola



Continental

WAISIN AW

Elektrobit

WirelessCar

JABIL



mapbox

DEEPMAP



tu simple



WeRide 文远知行

-chargepoint-

edmunds

Cox
AUTOMOTIVE™

FASTGO

SRISE



Thank you

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