AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

IOT 212

Introducing AWS IoT FleetWise for Automotive

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Agenda

Connected Vehicles By the Numbers

Current Connected Vehicle Challenges

Key Features and Benefits of AWS IoT FleetWise

NXP S32G Vehicle Processing Platforms

AWS IoT FleetWise Demo

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Connected Vehicles by the Numbers

95%



Of vehicles will be connected by 2030

37,500x



More daily data from autonomous vehicle than a smartphone

10



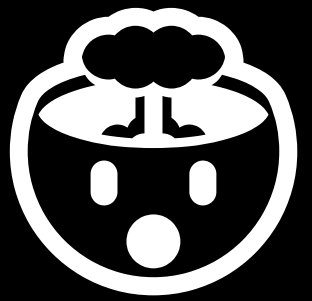
Exabytes of vehicle data by 2025

Per Forbes and McKinsey estimates

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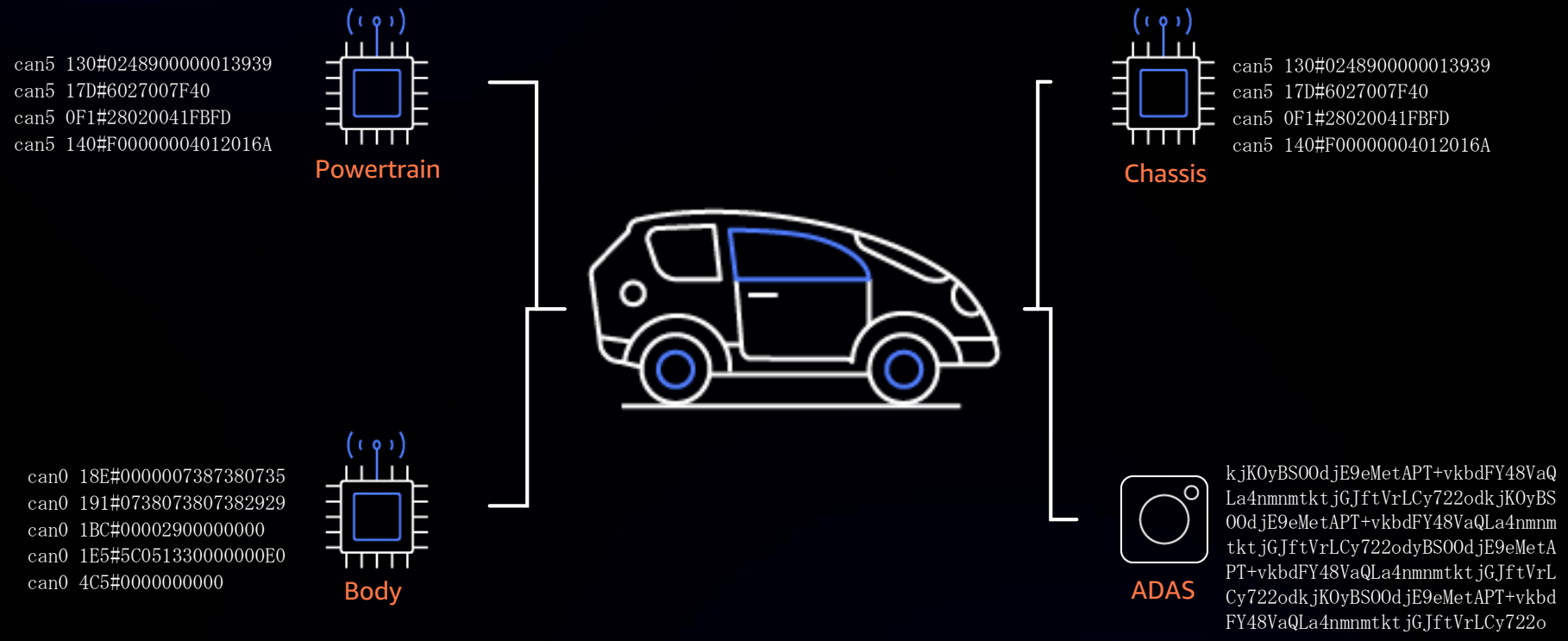
Advanced Vehicles Create Advanced Problems

30,000 Parts x 1,400 Tier 1 Suppliers x 14 Average models (U.S.A)) =



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A Challenge on a Single Vehicle



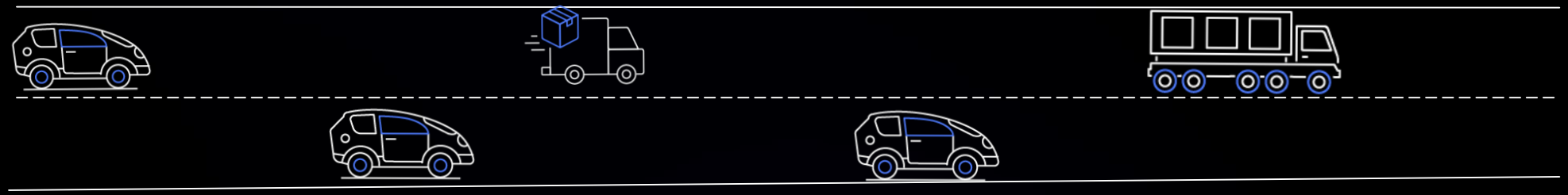
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An Even Bigger Fleetwide Challenge

```
can0  1C7#06A0B95E00003F
can0  1C8#0000000000000000
can0  137#1603075226D70409
can0  1DF#851800
can0  1E9#00A0000E00E10000
can0  1F4#000000000000
can0  287#820000075B00
can0  2C3#075D068C00009900
can0  2CD#C02C03D3FA
```

```
can0  1AF#00001015013A00FF
can0  1F5#2303000400000900
can0  4E9#E10005D6D200
can5  1CA#07D8180000000130
can0  184#07D828001A2E00F4
can5  1E5#5C05135000000100
can0  1E5#5C05135000000100
can5  335#270E0000
```

```
can0  3C1#0765F70000000000
can0  3D1#0164000020CF007F
can0  3D3#00A920003FFF4B47
can0  3D9#0200000061
can0  3E9#0898152D088B14FC
can0  4E1#4D36313035343236
can0  189#CFFF0FFF2FFEFF7E
can0  19D#C0003FFD001AD13D
can0  1A6#44000000
```



```
can0  18E#0000007387380735
can0  191#0738073807382929
can0  1BC#00002900000000
can0  1E5#5C051330000000E0
can0  4C5#0000000000
can5  130#0248900000013939
can5  17D#6027007F40
can0  0F1#28020041FBFD
can5  140#F000000040120l6A
```

```
can0  1BA#073568C6AA7358B3
can5  180#6000000000000090
can0  1C3#07380735FF202902
can5  1D5#40001FFE40001FFE
can5  1E9#2200E100A0
can0  1C4#3662C2D0022907D6
can0  1C5#2CF82BD92F80
can5  212#860003FD0200C1F4
can0  1BA#073568C6AA7358B3
```

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Organizing Automotive Data

VehicleID	timestamp	Brake_pressure	Vehicle_Speed_ Wheelsensor	TGrSel	Vehicle_Speed _Transmission
JY123D5	1635393799	null	null	1	101.759
JY123D5	1635393799	67.8	54.22	null	null
JY453K7	1635399282	45.2	null	3	null
JY529H3	1635392711	29.4	null	2	null
JY291T1	1639801739	2940.9	65.92	null	106.087

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Challenges with Connected Vehicles



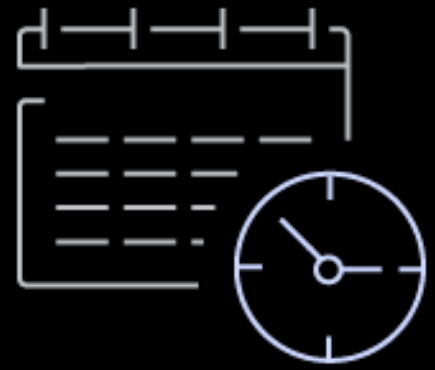
Data volume

Higher levels of vehicle autonomy generate vast amounts of data from advanced sensors like radars and cameras, which make cloud data transfer cost prohibitive



Data access

Each vehicle model's unique and proprietary data format requires building custom data collection systems



Data timeliness

Data comes too late for automakers to quickly mitigate fleet-wide problems or provide customers with preventative maintenance

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AWS IoT FleetWise

Making it easier and more cost-effective to collect, transform, and transfer data from millions of vehicles to the cloud in near real time

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AWS IoT FleetWise

Easily collect, transform, and transfer vehicle data to the cloud at scale



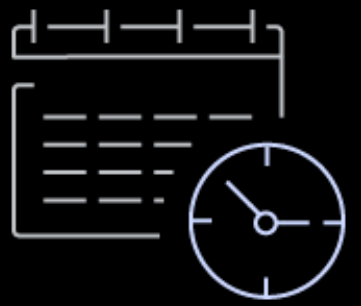
Easily access standardized, fleet-wide vehicle data

Build virtual representations of vehicles and apply a common data format to structure and label vehicle attributes, sensors, and signals



Reduce costs with intelligent data filtering

Select which data to transfer and define rules and events for when to transfer it, and dynamic data selection automatically reduces redundant data



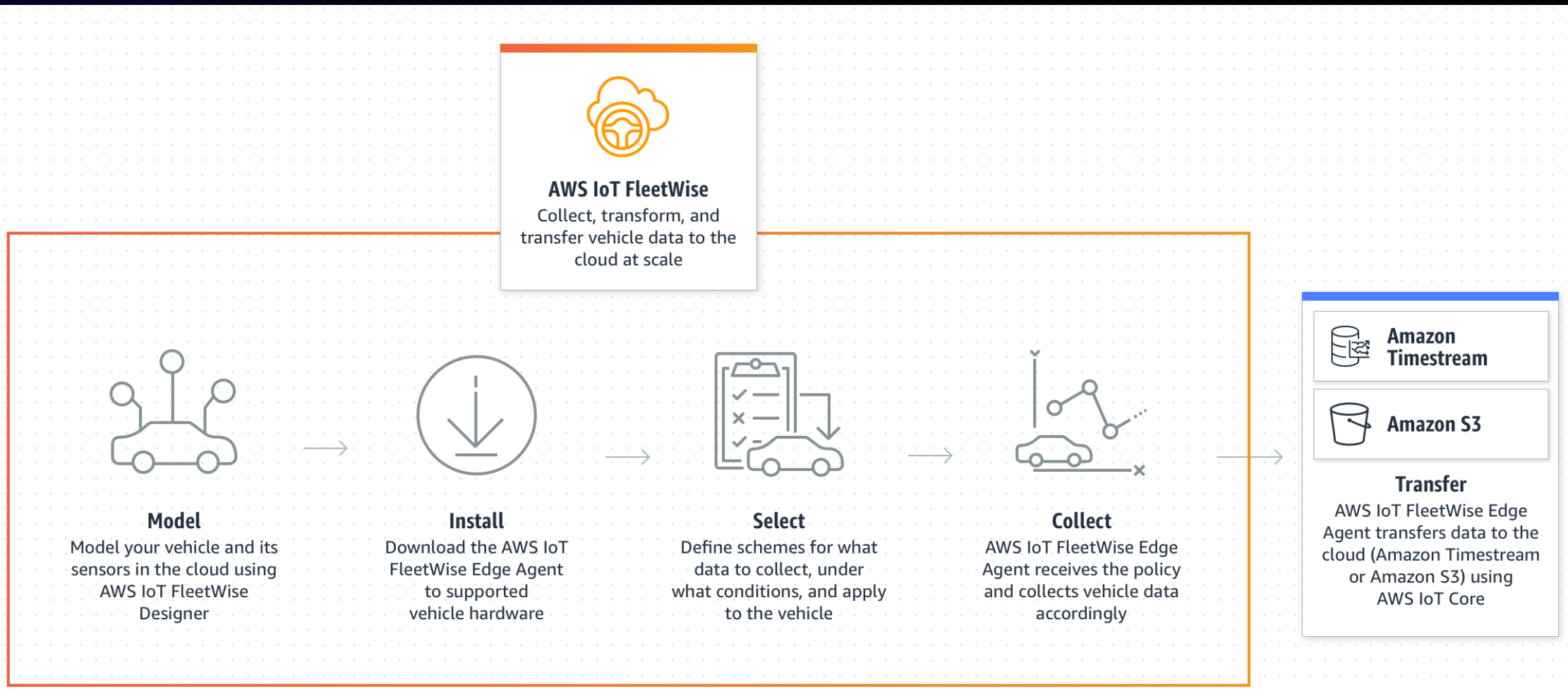
Detect and mitigate problems more quickly by surfacing vehicle data in near real time

Take quick, corrective action by notifying operations or manufacturing groups when problems occur in near real time

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How it Works



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AWS IoT FleetWise Vehicle Modeling



Model vehicle attributes, sensors, and signals

Label vehicle attributes and sensors using a centralized signal repository

Upload a standard CAN database file (CAN DBC) to read signals

Build virtual representations of vehicle models

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AWS IoT FleetWise Edge Agent



Facilitates communication between the vehicle and the cloud

- Install the edge agent to supported vehicle hardware (currently NXP S32G platform)
- Source code can be used as-is or extended to support customer requirements
- Edge agent receives data collection schemes from the cloud and collects data accordingly for cloud transfer
- Automakers maintain full data ownership and control of proprietary information

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AWS IoT FleetWise Rule-Based Collection



Define schemes for what data to collect

Determine what signals to collect, how often to collect them, and when to collect them

Fully managed deployment of data collection schemes from the cloud to vehicles

Data collection is periodic, event-based, or crowd-sourced from vehicles within proximity of each other

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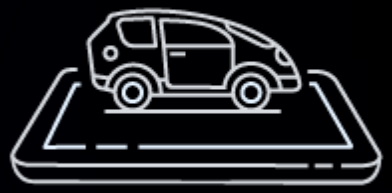
AWS IoT FleetWise enables many use cases



Train computer vision models for autonomous vehicles



Minimize warranty claims and recalls and react more quickly



Improve EV range estimates and provide timely notifications to drivers



Near real-time changing road conditions

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NXP S32G Vehicle Processing Platforms

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Addressing In-Vehicle Data Growth

NEW TYPE OF AUTOMOTIVE PROCESSING PLATFORM NEEDED TO COLLECT AND PROCESS VEHICLE DATA

Processing

~1000 DMIPS → 10,000+ DMIPS

New vehicle services, edge data processing, edge-to-cloud infrastructure

10x*

Networking

100 Megabit Ethernet → 1 or 2.5 Gigabit Ethernet

Vehicle data growth drives bandwidth – more sensors, AD/ADAS, Infotainment

10x*

Safety

ASIL B → ASIL D

Higher level of safety – ability to recover from faults (fail operational)

Security

HSM → HSE + ISOLATION

Public Key Infrastructure support, side-channel protection against hackers



* 10x relative to automotive gateway microcontrollers in vehicles today

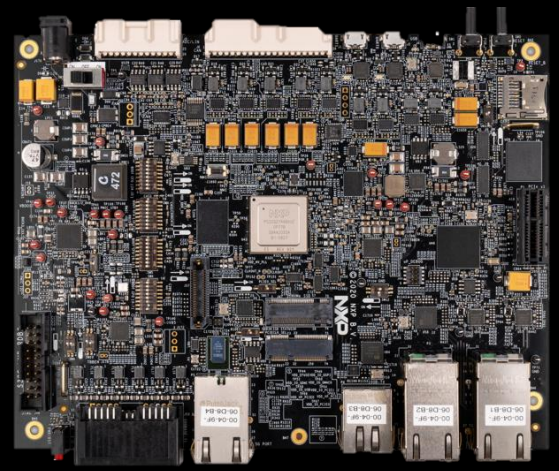
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NXP Reference Design Board and GoldBox

AUTOMOTIVE PROCESSING PLATFORMS FOR DESKTOP/LAB AND IN-VEHICLE APPLICATIONS

- Service-oriented gateway reference design with many CAN and ethernet interfaces for in-vehicle network processing
  - Based on automotive-grade NXP S32G Vehicle Network Processor
- Provides centralized vehicle data access, vehicle edge processing, and secure connectivity to AWS Cloud
- Integrates real-time and applications processing with hardware security, network acceleration and ASIL-D functional safety support
- Ideal platform for AWS IoT FleetWise development today



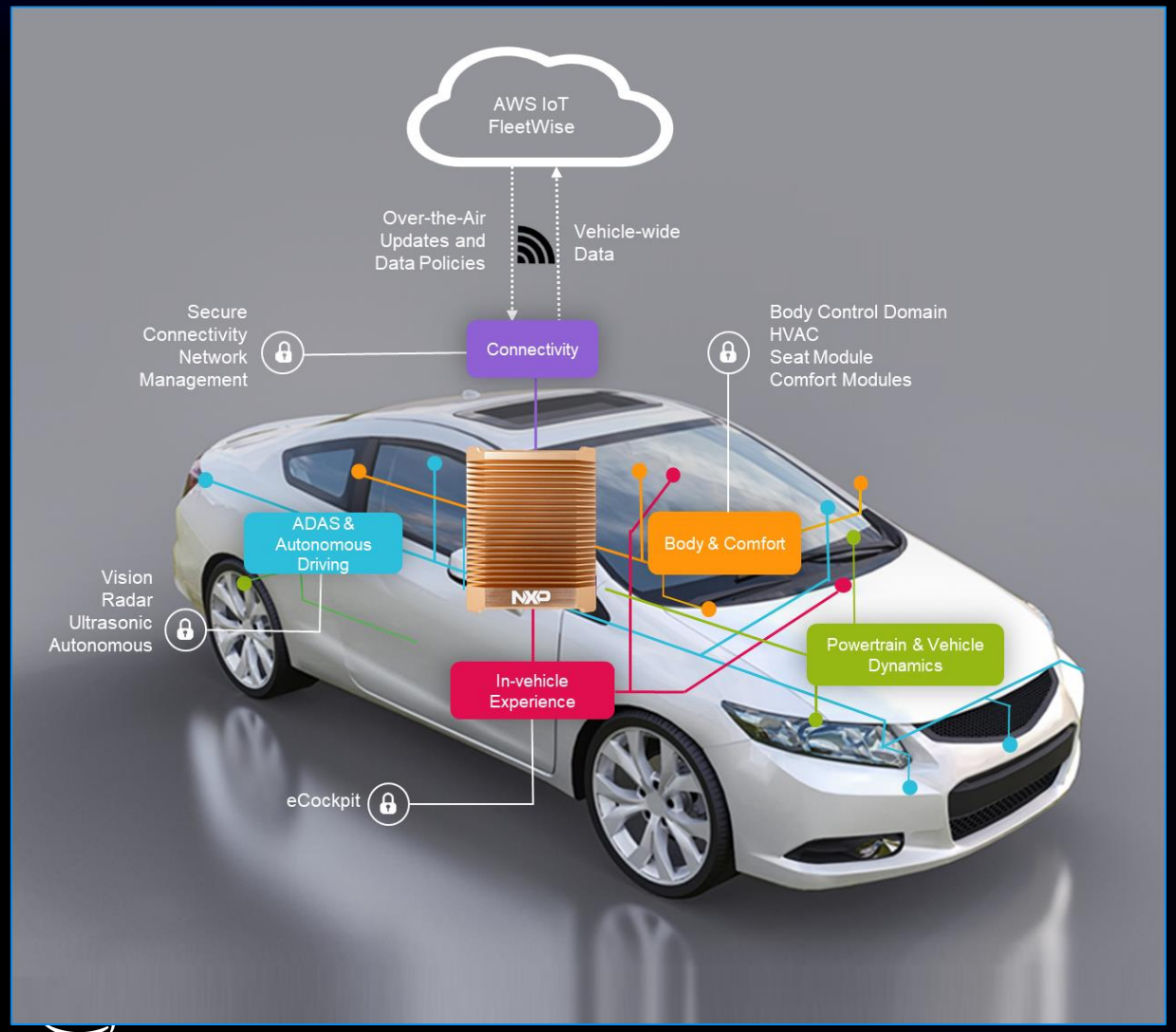


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Example Vehicle Configuration

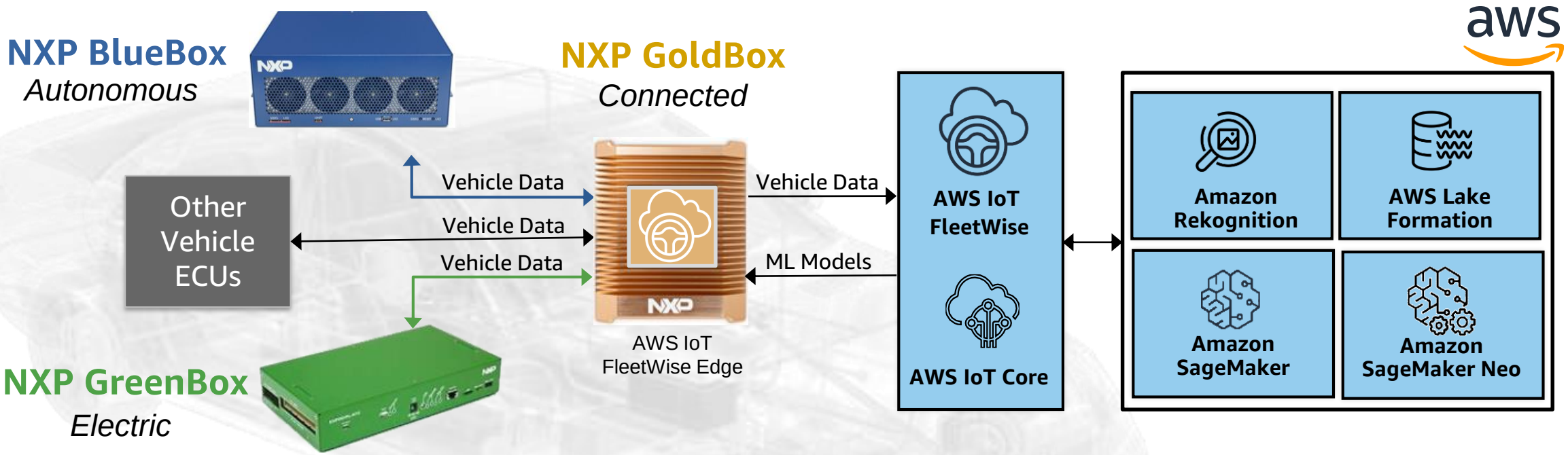
NXP GOLDBOX CAN PROVIDE CENTRALIZED ACCESS TO VEHICLE DATA



- NXP GoldBox can interface to vehicle domains
  - In-vehicle processing with access to vehicle-wide data
- Pre-integration with AWS IoT Greengrass v2 and AWS IoT FleetWise agent supports rapid deployment of vehicle edge-to-cloud services and smart data collection
- Together, NXP and AWS offer an end-to-end platform solution for connected vehicles

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NXP AND AWS ADDRESS AUTOMOTIVE MEGATRENDS WITH IN-CAR AND CLOUD-BASED SOLUTIONS



Predictive Maintenance

Advanced Vehicle Diagnostics

Usage Based Insurance

Telematics & Fleet Management

Vehicle Safety & Security

Upgradeable Vehicle

Usage & Feature Analytics

Public Safety

Thank you!

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