Innovate and modernize connected vehicle platforms with AWS IoT

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Agenda

01 Intro

02 Connected Vehicle platforms with AWS

03 Modernizing the vehicle data platform

04 Customer journey: American Honda Motor

05 Takeaways
Automotive innovation pioneer

Benz Patent-Motorwagen (1885)

Bertha Benz – Auto Pioneer (1870)
Cloud-enabled connected use cases

- Feature updates
- Customer experiences
- Data gathering & insights
- Internal insights
- Innovations & apps
- Customers
- Ecosystem
- Electrification
- Subscription services
- Map and trip solutions
Reasons customers choose AWS for Connected Vehicle

- Scalability
- Multi-Region
- Reliability & security
- Cost savings
- Data efficiency
AWS IoT Core for Connected Vehicle platforms

270M+ connections
Unique devices connecting to AWS IoT per day

Millions of vehicles
Using AWS IoT services for Connected Vehicle platforms
Connected Vehicle platform architecture

- **APPLICATIONS & USE CASES**
  Use cases, differentiation, ecosystem partners, internal applications, etc

- **OPERATIONS LAYER**
  Monitoring, customer support

- **SOFTWARE ABSTRACTION LAYER**
  Containers, CI/CD

- **DATA ABSTRACTION LAYER**
  Model, select, collect

- **COMMUNICATIONS (TRANSPORT) LAYER**
  Secure connection from vehicle to cloud (MQTT)

- **DEVICE LAYER**
  Hardware abstraction, OS, secure onboarding and management

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Connected Vehicle: Build vs. Buy

**Build & Evolve**

- AWS IoT and related services
- Connected Vehicle reference architectures (CVRAs)
- BOSCH Elektrobit
- Partner Community
- Connected Mobility Solution (CMS)

**Buy & Integrate (hybrid)**

- Complete platforms
  - WirelessCar
  - motive
  - OEMs
  - Fleet operators

- Hybrid integrations
  - Visteon
    - OTA
    - App store
    - Subscription management
    - Camera streaming
  - Continental
    - CAEdge for SDV AV/ADAS
Innovate and enhance your existing Connected Vehicle platforms with AWS IoT

#1 Vehicle Communication (MQTT)

AWS IoT Core

#2 Vehicle Data Platform

AWS IoT FleetWise

#3 Vehicle Video Platform

Amazon Kinesis Video Streams
Connected Vehicle architecture with AWS IoT

**USE CASES & APPLICATIONS**

**VEHICLE COMMUNICATION**
AWS IoT Core

**VEHICLE DATA PLATFORM**
AWS IoT FleetWise

**VEHICLE VIDEO PLATFORM**
Kinesis Video Streams

**VEHICLE HARDWARE, EMBEDDED SOFTWARE, NETWORKS**
Hardware abstraction, OS, secure onboarding and management

Remote Vehicle Commands
Subscription management
Vehicle Health Monitoring
Silent Test Mode for AV/ADAS
Vehicle Security Mode (live stream)
Vehicle View

Offboard
Onboard
Infrastructure enhancement #1: AWS IoT Core for managed MQTT

MQTT is the de facto standard protocol for vehicle-to-cloud communication.

AWS IoT Core auto scales to support millions of vehicles deployed worldwide.

Easily build and deploy new use cases (vehicle shadow, subscription management, location services).
Remote Vehicle Commands with AWS IoT Core

Use case features

- Remote vehicle start/stop
- Remote lock/unlock
- Cabin preconditioning (AC/Heat)
- Enable/disable anti-theft system
- Many others…
Infrastructure enhancement #2: AWS IoT FleetWise for data collection & management

**Vehicle**
- Edge Agent for AWS IoT FleetWise
- Central Gateway
- Vehicle network (Ethernet, CAN, LIN, etc)
- ECU

**AWS IoT FleetWise**

- **Improve data relevance** by sending only the data you need to the cloud
- **Standardize data** from a fleet of vehicles by modeling vehicles and sensors
- Build a range of **data-driven use cases** (vehicle data telemetry for health monitoring, vision system data for ADAS silent testing)
Vehicle Health Monitoring with AWS IoT FleetWise

Use case features

- Vehicle owners have access to vehicle status, maintenance alerts, and many other attributes
- OEMs can inform internal teams of vehicle health, predictive issues, and product usage (e.g., IVI)
- Drive statistics can be easily tracked for trip data use cases and new customer experiences
Infrastructure enhancement #3: Kinesis Video Streams for vehicle camera use cases

- Video streaming from vehicle cameras (in-cabin or external) to cloud and devices
- Quickly & easily scale to millions of vehicles and media streams globally
- Enables innovative new customer use cases (vehicle security mode, 3D view, real-time video streaming)
Vehicle Security Mode with Kinesis Video Streams

Use case features

- Build an innovative, differentiating feature using Kinesis Video Streams to live-stream video from any vehicle camera
- Customers use a mobile client to select and view a camera stream, while vehicle is in motion or stationary
- Can be used to offer Vehicle Security Mode, for event alerts and video storage or streaming to check and monitor vehicle status
Reference Architecture: Modernizing Connected Vehicle with AWS

- **AWS Cloud**
  - Request IoT topic
  - Response IoT topic
  - AWS Lambda
  - Amazon DynamoDB
  - AWS Amplify
  - Amazon API Gateway
  - Amazon Timestream
  - AWS Lambda
  - Amazon API Gateway
  - Amazon S3
  - Amazon CloudFront
  - Amazon Cognito
  - AWS Amplify

- **Vehicle Gateway**
  - Connected car
  - Vehicle telemetry
  - mTLS
  - AWS IoT Core
  - Shared subscription
  - AWS ECS
  - Containers
  - Amazon Timestream
  - Amazon S3
  - AWS Amplify

- **Data Ingest with Shared Subscriptions**
  - Specialized header
  - IoT topic
  - Containers
  - Amazon Timestream
  - Amazon S3

- **Improved Device Control with Session and Message Expiry**
  - Command IoT topic
  - Amazon DynamoDB
  - AWS Lambda
  - Amazon API Gateway

- **Communicate Critical Messages with Retained Messages**
  - Critical command IoT topic
  - AWS Lambda
  - Amazon DynamoDB

- **Data Visualization**
  - Vehicle management platform
  - Companion application
  - Vehicle owner

- **Data Ingest with Shared Subscriptions**
  - Specialized header
  - IoT topic
  - Containers
  - Amazon Timestream
  - Amazon S3

- **Connected Car**
  - Vehicle gateway
  - MQTT and OpenSSL libraries
Customers using AWS IoT for Connected Vehicle

- TOYOTA
- HYUNDAI
- HONDA
- Visteon
- WirelessCar
- Continental
- motive
- mX | TELEMATICS
- LG
Modernizing the Vehicle Data Platform
What’s missing?
Data delays = development delays
AWS helps accelerate development

- Accelerate software development and time-to-market
- Release higher quality code, reduce updates and recalls
- Deliver enhanced user experiences
- Use vehicle data to make improvements over time
Managed foundational infrastructure to deploy CM platform

A comprehensive, extensible, secure, and flexible CM architecture

Ready-to-deploy catalog of use cases developed in-house or sourced from partners

A comprehensive data strategy that accelerates value realization

200+ partners bring solutions that support automotive workloads
Accelerate development with fully managed AWS services

- AWS IoT FleetWise
- Purpose-built for the automotive industry to collect vehicle data more efficiently
More cars, more cameras, exponentially more data
Vision system data from AWS IoT FleetWise

New Preview

- Collect and organize data from vehicle vision systems that include cameras, radars, and lidars

- Gain a full picture view of structured and unstructured vision system data, metadata, and telemetry data and keep it automatically synchronized in the cloud

- Take advantage of the AWS IoT FleetWise features and interfaces you already use to collect telemetry data
“Continental has collaborated closely with AWS on developing technologies that accelerate automotive software development in the cloud. With vision system data from AWS IoT FleetWise, we will be able to easily collect camera and motion-planning data to improve automated parking assistance and enable fleet-wide monitoring and reporting.”

Yann Baudouin
Head of Data Solutions - Engineering Platform and Ecosystem, Continental AG
Customer Journey:
American Honda Motor
Implementing MQTT on real production vehicles

Agenda

- How connected vehicles worked before MQTT
- Challenges with the legacy approach
- How MQTT helped resolve legacy issues
- Overcoming obstacles migrating to AWS IoT
- New vehicle features enabled by MQTT
How connected vehicles worked before MQTT

Used SMS (text messages) to wake up IoT devices
Legacy connected vehicles also used this method
Challenges with the legacy approach

- High latency / throttling using SMS
Challenges with the legacy approach

- Timeout base architecture in low signal area

30 – 60 sec
AWS IoT launches managed MQTT support

- AWS announced the managed MQTT endpoint in 2015
- Easy to start/test on AWS

Always keep an eye out for new technology
Modernizing the legacy platform with MQTT

- Maximize legacy assets
- Minimize new technology risk
Modernizing the legacy platform with MQTT

- Low latency for waking up the vehicle
- Be scalable during spikes
- Long-lived connections to a fully managed service
- Can observe offline before posting command
Overcoming obstacles migrating to AWS IoT

- Isolate Production from Non-Production
Overcoming obstacles migrating to AWS IoT

- Use one AWS IoT Account
- Differentiate Non-Prod using MQTT Topic
New features for ACCORD using MQTT
New features for ACCORD using MQTT

• Remote door lock / unlock (improved response)
• Remote engine start with climate (improved response)
All new ACCORDs have these features

- Remote door lock / unlock
- Remote Start & Stop
- Geofence Alert
- Speed Alert
- Security Alarm Alert
- Vehicle Locator
Benefit summary of managed MQTT from AWS IoT

- Best way to provide long-lived connections to a fully managed service
- Can scale automatically
- Available now for production vehicles
- Easy to develop a PoC using AWS IoT tools
- HTTP can be used for large data transactions

Closing Thought: Keep an open mind for new technology
Takeaways & related IoT sessions
Takeaways

1. Use AWS IoT services to enrich, modernize, and add innovations to your Connected Vehicle platform
2. Include AWS in your journey – we love to collaborate and help builders build
3. Work with your AWS team to schedule follow-up meetings

Related IoT sessions @ re:Invent 2023:

- IoT 210 | Managing big data workloads from connected vehicles with AWS IoT
- IoT 311 | Build architectural patterns for IoT data ingestion and visualization
- IoT 309 | Innovate your applications using AWS IoT Core with MQTT 5
- IoT 305 | Detecting EV battery anomalies across a fleet using AWS IoT
Thank you!

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