AWS re:Invent

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AUT307

Supercharge applications with insights from vehicle signals

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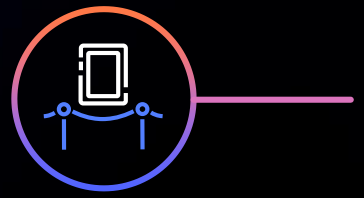
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AWS

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Agenda



Introduction to BlackBerry IVY



Demonstration



Q&A

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Introduction to BlackBerry IVY

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Strategic alliance for co-development



- Trusted leader in automotive safety and security
- Deep knowledge of embedded automotive software systems
- Exceptional track record of delivery, integration, and support



- A leading global cloud provider with a culture of innovation
- Known for machine learning expertise and IoT capabilities
- Proven builder of successful developer ecosystems

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BlackBerry IVY advantage

Data ownership



OEM customers will own their data, including any revenue generated from the access to and services created from the data

No lock-in



BlackBerry IVY is designed to be OS and cloud data plane agnostic, preventing vendor lock-in while broadening customer technology options

Deployment flexibility



BlackBerry IVY is designed to support multiple vehicle domains (e.g., powertrain, body, ADAS, cockpit controller) with flexible deployment options (e.g., Gateway modules and connectivity modules)

We are not a competitor



BlackBerry IVY is looking to complement OEM vehicle platforms, accelerating development by leveraging pre-integrated automotive qualified services, in order to allow the OEM to focus on their value streams

Access to a community

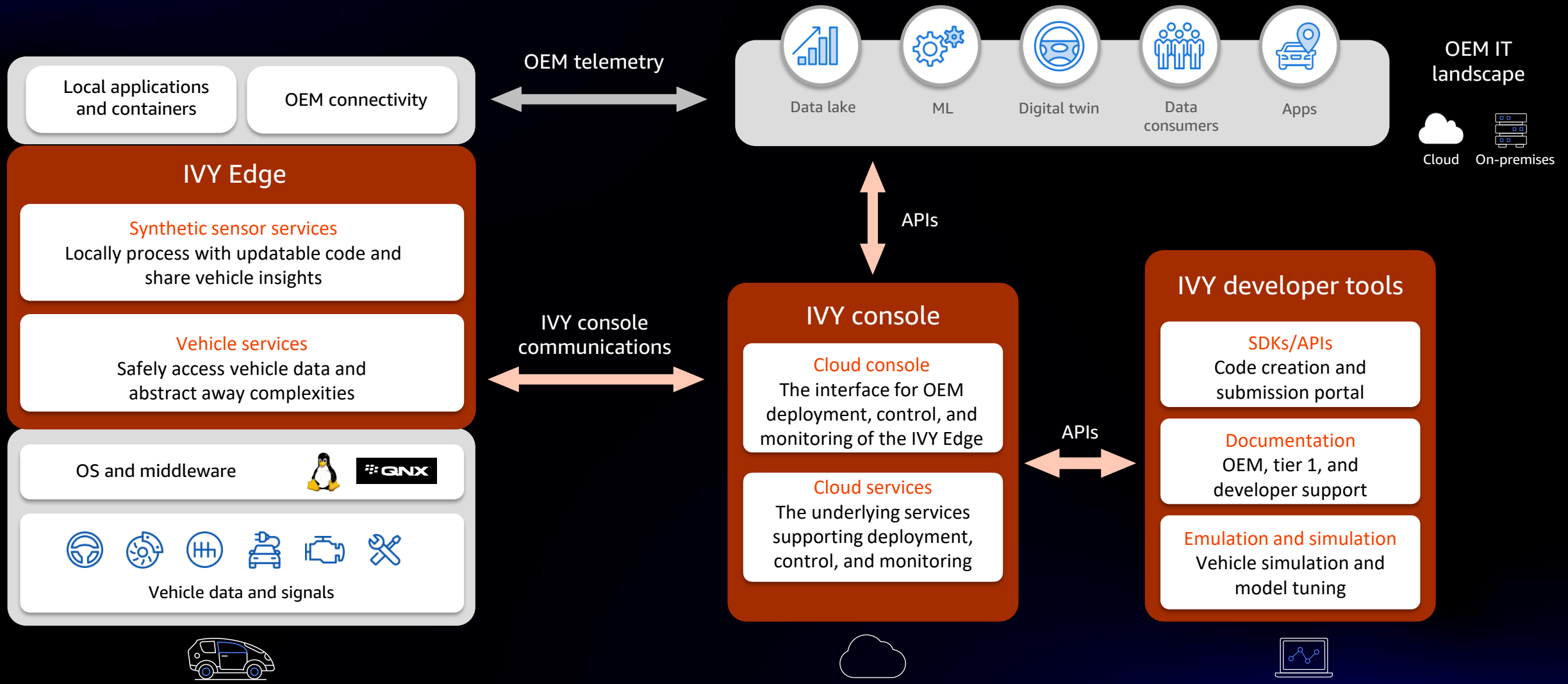


We are designing BlackBerry IVY to be open as much as each OEM chooses to open up access to support development of a transformational automotive community

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BlackBerry IVY: High-level architecture



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BlackBerry IVY: Synthetic sensors

Raw vehicle data

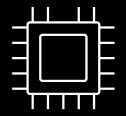
Processing

Applications using shareable insights



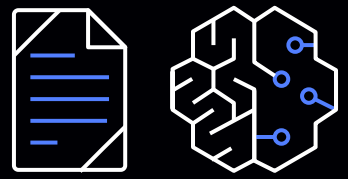
In-vehicle camera

Sensor data



Seat sensor

Sensor data



Synthetic sensor

Insights:

# of passengers

# of adults

# of children

Location of passengers

Profile ID

App #1: food/retail

Provide offer for 1 adult and 1 child

App #2: music player

Restrict music with explicit lyrics

App #3: customization

Retrieve cabin preferences

IVY Edge

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Demonstration

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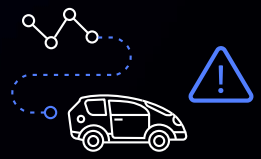
EV Range Expert: Storyboard

1



Our demonstration follows the day of a fictitious family taking a long road trip in their EV to spend the day at the beach. EV Range Expert will help them during the journey.

2



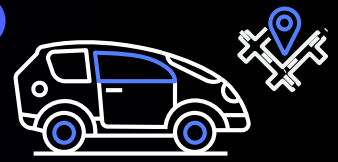
The drive begins with a sporty driver, identified via facial recognition as they start the car. During the trip, a long traffic jam causes their predicted range to drop below the remaining round-trip distance.

3



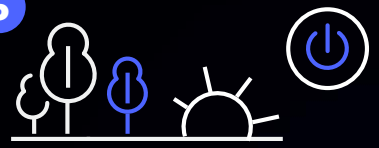
Based on the sporty driver and remaining charge, the family is informed that they will need to stop at a charging point on the way home. The family arrives at the beach, parks the car, and enjoys the sunshine.

4



After their day at the beach, and now that the sun has gone down, the family gets back into the car for the drive home. The adult who was a passenger on the journey to the beach takes over driving.

5



The new driver is identified as having a much more economical driving style. As the sun has gone down and the children wish to sleep, auxiliary services (HVAC, entertainment, etc.) are powered down.

6

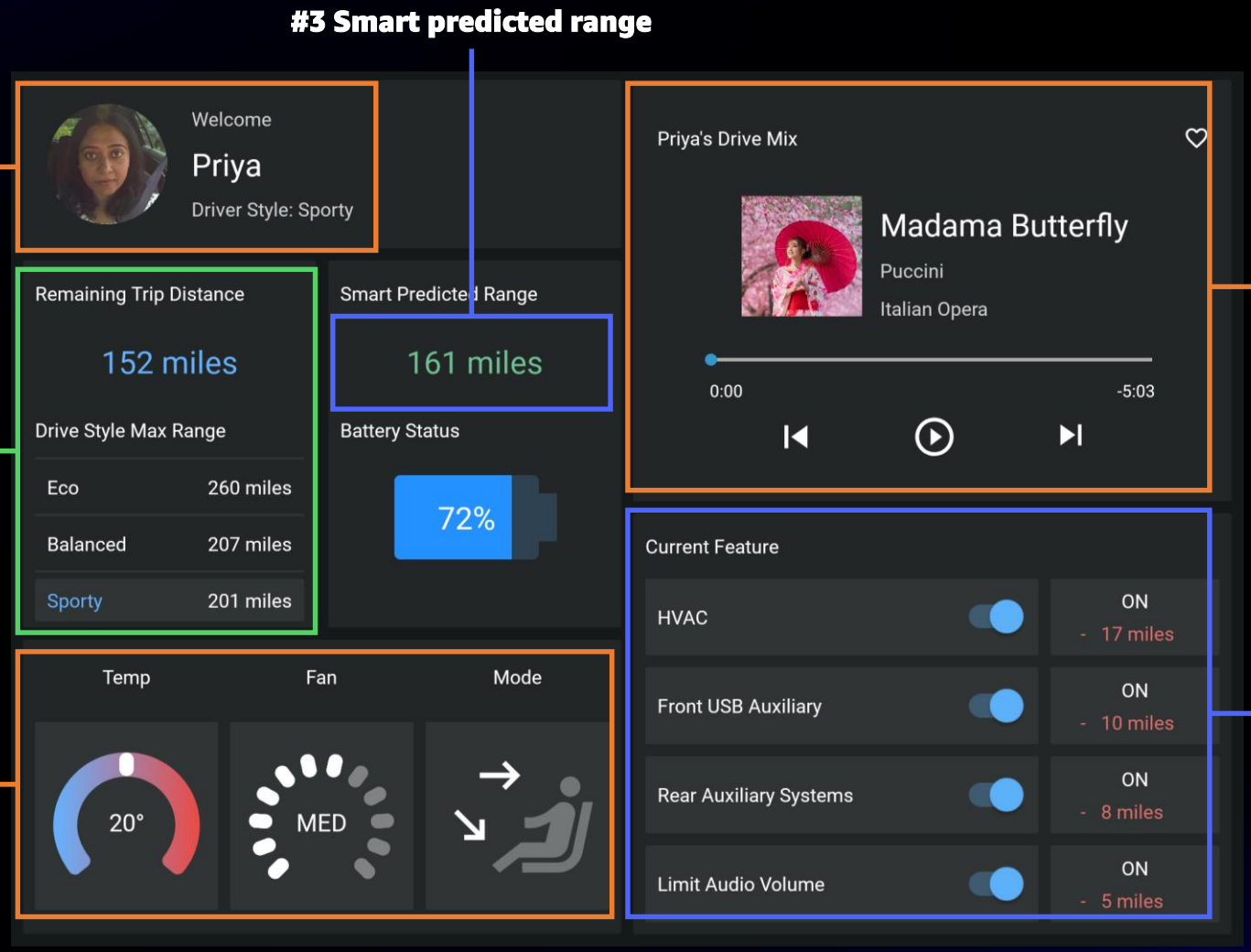


EVRE calculates that with the more economical driving style and reduced auxiliary services, the car can get home without stopping to recharge, thus saving the family time and worry.

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EV Range Expert: UI



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EV Range Expert: Architecture

Raw vehicle data

Camera → Sensor data

Geo location → Sensor data

Battery management → Sensor data

Feature settings → Sensor data

#1 Driver identification

Identify the driver in the vehicle with computer vision and load their profile

#2 Driving style

Predict range of the vehicle from the driver profile using machine learning

#3 Smart predicted range

Output the smart predicted range of the vehicle taking into account the current feature utilization

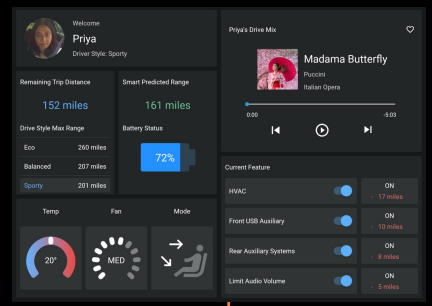
Insights:

- Identity of driver
- Driver profile
- Driving style range prediction
- Vehicle range prediction

Shareable insights used by application

EV Range Expert 1.0

Android application showing infotainment view



IVY Edge

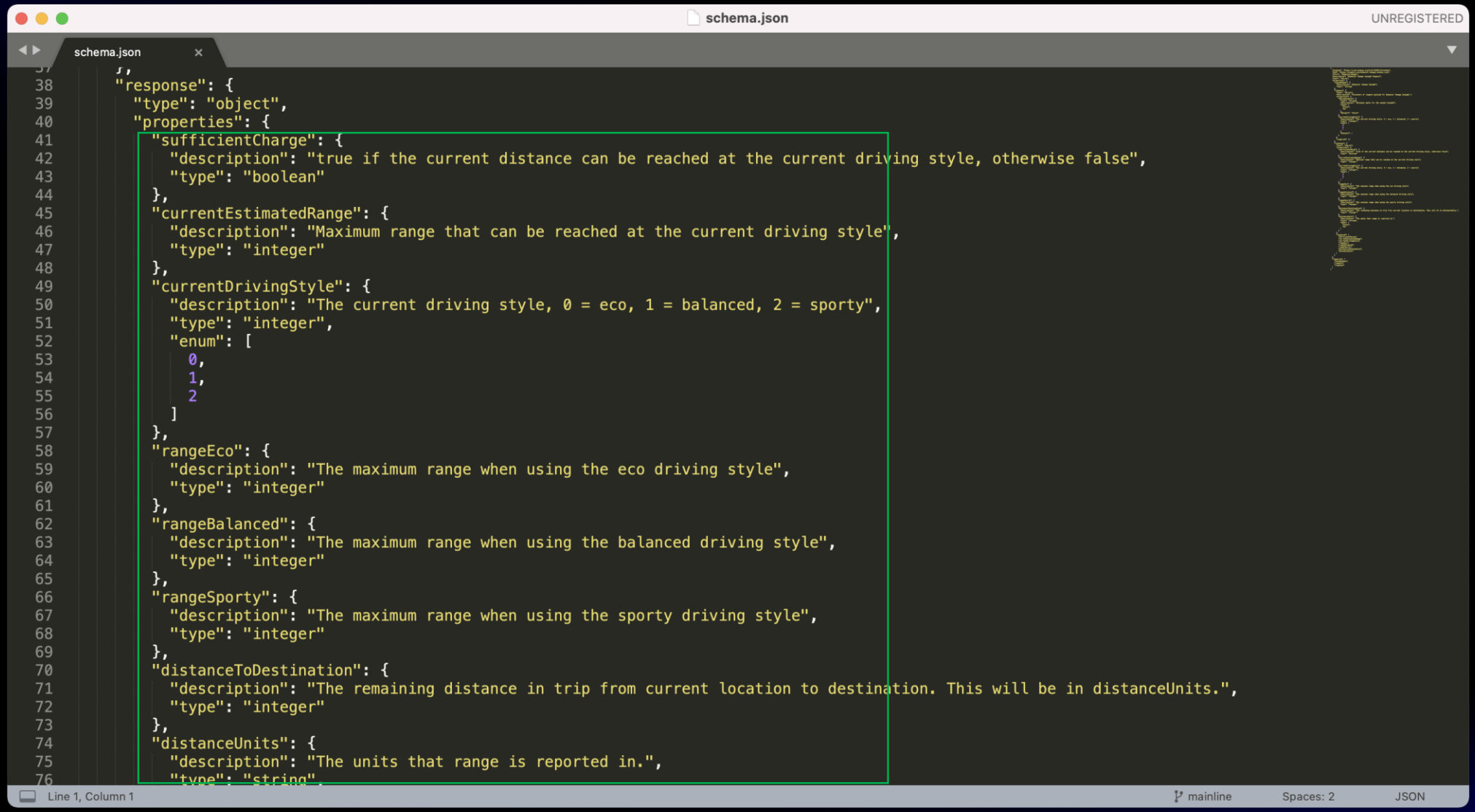
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Code example – Driver behavior insights


```
{
    "sufficientCharge":true,
    "currentEstimatedRange":256,
    "currentDrivingStyle":1,
    "rangeEco":321,
    "rangeBalanced":256,
    "rangeSporty":250,
    "distanceUnits":"miles”,
    "distanceToDestination":190
}
```


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Code example – Driver behavior schema insights



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Code example – Driver behavior manifest

ivy.toml

```
[package]
    name= "evdriverbehavioursensortask"
    description="Predicts the EV range based on the current driving style."

[build]
    prepare = "../../../custom-build.sh"

[dependencies]

[tasks.EvDriverBehaviorSensorTask]
    insight.schema = "schema.json"

[[rules]]
[[rules.triggers]]
    type = "location"
[[rules.triggers]]
    type = "system"
[rules.condition]
expression = "lat != -1"
    variables = [
        {lat = {value = "/location/latitude"}}
    ]


[rules.actions]
    start_task = "EvDriverBehaviorSensorTask"
```

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Code example – Driver behavior machine learning in synthetic sensor

EvDriverBehaviorSensorTask.cpp — UNREGISTERED

EvDriverBehaviorSensorTask.cpp

```
129         auto inputValues = dynamic_cast<EvDriverBehaviorValues *>(values.get());
130         auto req = dynamic_cast<EvDriverBehaviorRequest *>(request.get());
131 #if DEBUG
132         cout << "EvDriverBehavior :  Processing using request values (" << *inputValues << ")" << endl;
133 #endif
134         RangePredictor range;
135         DriverInRangePredictor driverInRange;
136
137         try {
138             auto distanceInKm = static_cast<int>(SensorHelpers::HaversineInKm(
139                                     inputValues->getCurrentLatitude(),
140                                     inputValues->getCurrentLongitude(),
141                                     destinationLatitude->getValue(),
142                                     destinationLongitude->getValue()));
143
144             auto batteryLevel = inputValues->getBatteryLevel();
145             auto drivingStyle = inputValues->getDrivingStyle();
146
147             auto currentStyleInRange = driverInRange.predict(distanceInKm, batteryLevel, drivingStyle);
148             auto currentMaximumRange = range.predict(batteryLevel, drivingStyle);
149             auto maximumEcoRange = range.predict(batteryLevel, DRIVING_STYLE_ECONOMY);
150             auto maximumNormalRange = range.predict(batteryLevel, DRIVING_STYLE_STANDARD);
151             auto maximumSportyRange = range.predict(batteryLevel, DRIVING_STYLE_SPORTS);
152
153             int distanceToDestination = distanceInKm;
154
155             if (req->getDistanceUnits() == DistanceUnit::Miles) {
156
157                 currentMaximumRange = static_cast<int>(static_cast<float>(currentMaximumRange) /
158                                                        KM_TO_MILES_FACTOR);
159
```

Line 1, Column 1 — mainline — Spaces: 4 — C++

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Thank you!

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