

Smart EV Routing

Eliminate the Uncertainties for Electric Vehicle Drivers

WirelessCar offers Smart EV Routing to provide car manufacturers (OEMs) with in-car navigation specifically tailored to the EV drivers' needs along with the flexibility to use the map provider and charging networks of their choice. The product uses the specific vehicle model's charging curve combined with live data from the vehicle and environment to provide the most optimized route. The product ensures that EV drivers get the assistance they need to make their long-distance journeys as smooth and efficient as possible.

Smart EV Routing is based in the belief that OEMs can make electric vehicles (EVs) more accessible by providing the right tools and education to the next generation of EV drivers. There are many complex factors that impact the range of an EV. While this complexity was acceptable and even a probable area of technological interest to early adopters, it may be intimidating to future adopters. The uncertainties about the actual range, as well as when and where to charge, can lead to low EV adoption, reversion back to Internal Combustion Engines (ICEs) and limit EV usage even when EVs are viable options for the consumer. By addressing the primary concerns of consumers, running out of battery power and not being able to find an available charging station, OEMs can ease the transition from ICEs and Hybrids to EVs.

This brief covers the following to provide a basis for understanding:

- Where our product fits in the existing OEM ecosystem
- An overview of the product
- How to learn more

Our Product and the OEM Ecosystem

Every OEM is unique. The solutions and capabilities that are available can vary based on geographical region, car models, car specifications or regulation, etc. WirelessCar provides OEM-specific services and integrations together with our products to achieve an efficient time-to-market with the highest reliability, quality, and security. Smart EV Routing is a key link in the chain between an OEM and their B2B and B2C customers looking to transition from ICEs to EVs.

Key Actors Involved in Providing EV Routing to the End User

The OEM

While Smart EV Routing comes with competitive pre-set partners and integrations, the OEM establishes the ground rules for what content will be used for their implementation of our product to provide the best experience for their customers.

If partnerships already exist between the OEM and specific charging network providers, the OEM can specify their preferences and display priorities based on their agreements.

In addition, the OEM can prefer to use their existing traffic, map or navigation provider in the routing advice and calculations, ensuring an alignment between the map data in the car and the calculations in the cloud.

The battery charging curve must be provided as input, along with a minimum set of data from connected EVs using the routing data. This data will be continuously consumed and enhanced to provide accurate predictions and charging and routing advice as environmental factors and vehicle systems impact the range and charging characteristics at any given time.

The OEM Development Organization

Whether from a third party or from the OEM itself, the OEM development organization uses WirelessCar's API to integrate the OEM's branded connected car mobile app and in-vehicle systems to the EV routing service.

These integrations allow the OEM to deliver a seamless experience between the mobile app—used for setting preferences and planning—and the car, where the route and charging guidance will be displayed on the OEM's map of choice.

Overview of the Value Chain and Where WirelessCar's Services Can Fit into the OEM Ecosystem

WirelessCar integrates with the OEM interfaces and content providers to collect the necessary data. The system hosts the business logic and the services that facilitate communication with the car, execution of services, and retrieval and processing of the necessary data.

Content provider integrations give access to weather, traffic, charging networks, navigation & routing data and amenities based on OEM preferences.

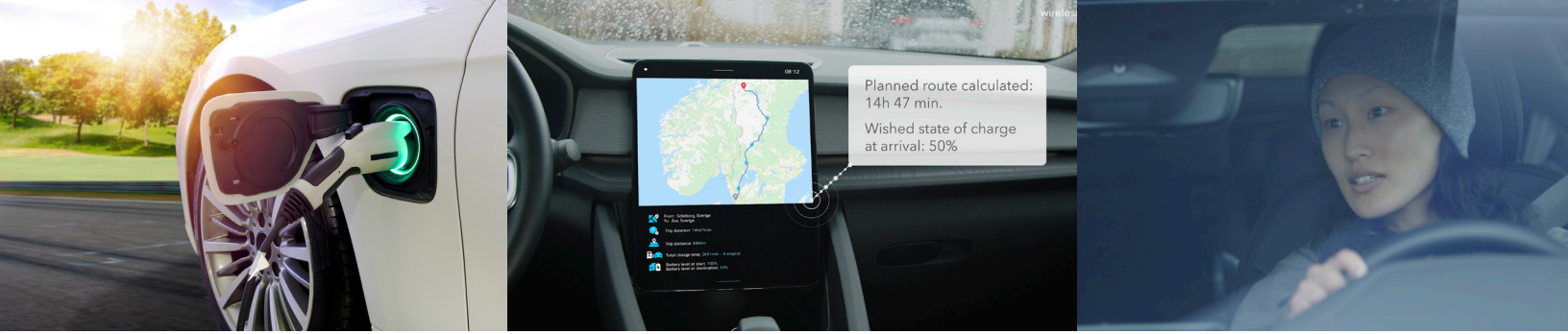


WirelessCar provides an application programming interface and a developer portal. This leads to a positive developer experience and a foundation for a secure integration between the car, mobile app and connected car cloud.

The OEM provides data from existing systems including factory data, vehicle configurations and characteristics, and - if an OEM connected car cloud exists - the necessary interfaces to obtain real-time usage, battery status and health from the car.

The OEM or OEM Partner acts as a client to the API, integrating the in-vehicle navigation system and OEM branded mobile app with WirelessCar's cloud to provide the necessary data on the user interfaces.

The EV driver benefits from services and the education and guidance by utilizing the provided user interfaces for planning trips using the mobile app or in-vehicle HMI and viewing the suggested routes and charging instructions.



The WirelessCar Cloud

The WirelessCar cloud uses the data available from WirelessCar’s products or data available from the OEM’s Connected Car Cloud. Content providers, battery charge prediction algorithms, and vehicle integrations are also used to plan and continuously refresh the route and charging guidance as the trip progresses.

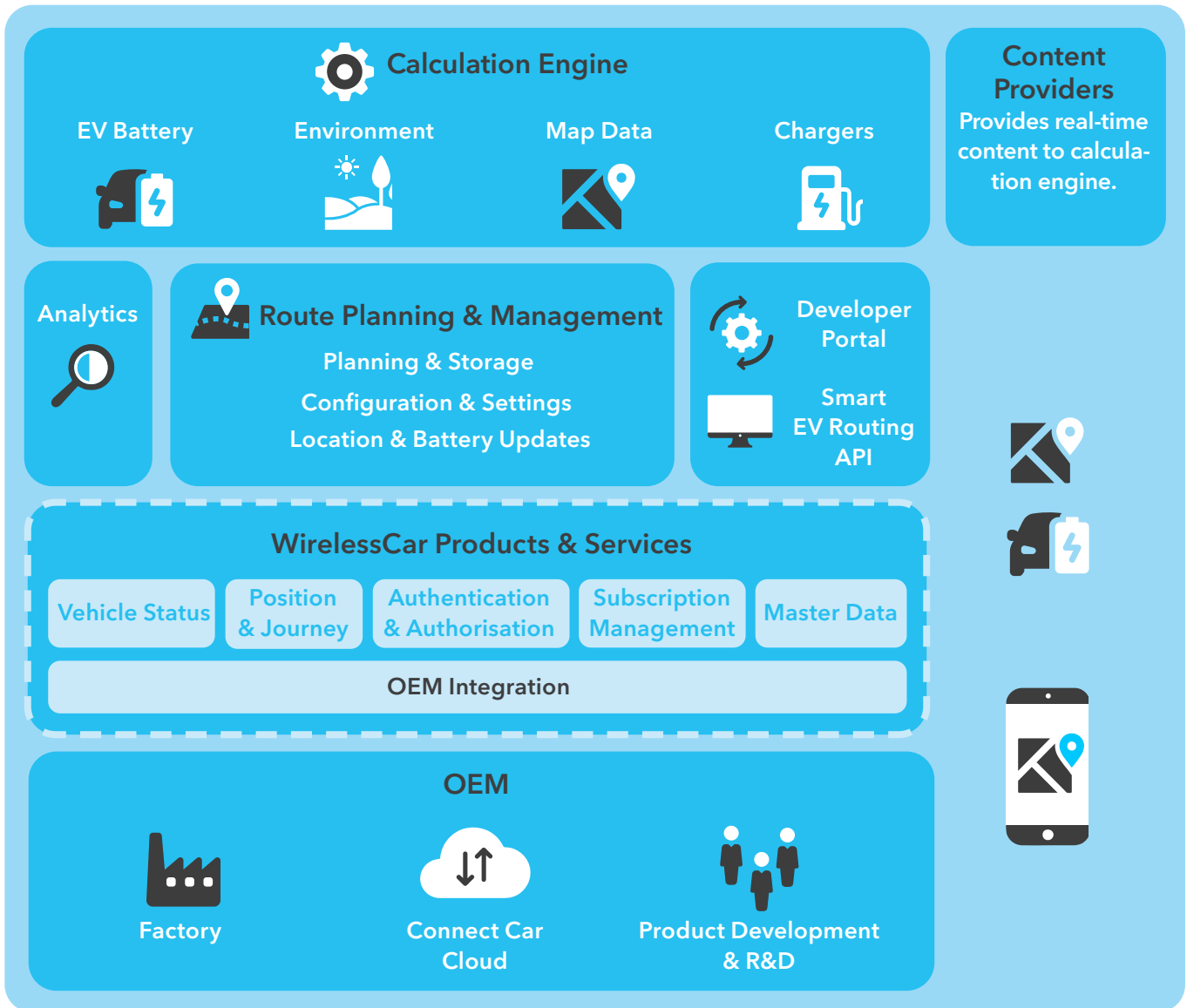
This includes utilizing data about weather, topography, driving style, payload, charging curve and more to determine the impact on the expected range. It is this area, where the confluence of real-time data from connected cars and data about where and how the car is being used, creates an accurate source of information for the driver.

Key Integrations and Data Points



Product Overview

The following overview shows the primary components and actors involved in Smart EV Routing. Business agreements, processes, local legislation, and existing technical implementations determine how the product is realized in the OEM ecosystem.



Smart EV Routing

The product provides route planning and execution for predicting range and charging based on real-time vehicle generated status data, external environment content (e.g., the current weather along the route, road conditions, temperature, traffic, topography and more which enables accurate advice to the driver along the way).

Other WirelessCar Products and Services

Smart EV Routing may integrate with some or all of WirelessCar's products. These products may or may not be utilized in a specific customer implementation depending on the solution chosen by the OEM, their existing connected cloud ecosystem, and the vehicle capabilities. We can, for example, use WirelessCar's Subscription Management to manage the provisioning and de-provisioning of a given service as well as its entire lifecycle (service payment, service renewal, service end-of-life).

OEM Integrations

The OEM integrations vary depending on vehicle generations and OEM in-house systems. However, generally they may include the Factory Data feed—to get static information about factory completed cars and their specifications—and uplink and downlink messages to carry dynamic data between the car and WirelessCar’s backend.

Both static and dynamic data are needed. Static data generally consists of descriptive data about the car, its VIN, make, model, color, etc. Dynamic data comes from the car at varying frequencies. A connected car can be configured with a sub-set of services, after which the car connects to the back-end and communicates its status and position. Status data generally includes information about odometer, battery charge, battery health, temperature, tire pressure, and various other sensor data. All data is collected and stored in the OEM tenant in the region where the vehicle is operational.

Note: The exact data which is used in the product depends on what information is available from the connected car’s interface. In addition to location data, the current state of charge as well as power consumption and regeneration is a minimum for providing accurate predictions for range and charging stops.

External content integrations ensure that the external factors that impact range are also considered in the route calculation and guidance.

Analytics

All the data collected provides numerous opportunities for data analysis which can lead to a better understanding of factors influencing deviations from the expected charge curve and how/where the cars are charging on an aggregated level. Aggregating and anonymizing this data gives further key information about customer behavior and use of EVs as well as the EV’s impact on the charging infrastructure per region and per market, for example.

Interfaces

API

The Smart EV Routing API acts as an entry point for developers and systems to implement features that allow users to plan trips, save trip plans, and access the routing and charging guidance from the WirelessCar back-

end services. The API exposes the end points—via an AWS API Gateway—that enables the OEM to build the routing data into their existing user interfaces.

Developer Portal

The developer portal is available to authenticated users and provides all of the necessary information and know-how to get started using the API’s features. Here, you will find documentation about how to get started and use the endpoints to support your implementation. Your integration efforts are supported by examples, FAQs and clear guidelines for request/response format and data. WirelessCar uses API guidelines and best practices based on Zalando.

Once you have gotten started, you will have access to methods that enable you to plan and continually update your routes with information.

All other integrations to satisfy pre-requisites for solution functionality are within the scope of the specific customer implementation and therefore not covered in more detail in this brief.

About WirelessCar

WirelessCar is one of the world’s leading innovators of digital vehicle services. We accelerate service creation and turn vehicle data into business value for consumers, mobility providers, vehicle makers and society. Founded in 1999, WirelessCar has continuously built upon our heritage and grown our expertise within the automotive industry. Today, we are a highly recognized and award-winning company, connecting more than eight million vehicles in over 100 countries. Headquartered in Sweden with offices in the US and China, WirelessCar works with OEMs such as Volkswagen, Jaguar Land Rover, Daimler, Nissan, Subaru of America and Volvo Cars to leverage the full value of connected services to achieve safe, smart, and sustainable mobility.

To learn more about WirelessCar’s Smart EV Routing, [please visit us online](#) or contact us directly to book a meeting or demo.

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