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Greece-Bulgaria

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D 5.2

INTEROPERABILITY PLATFORM

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Alliance of The Producers of Ecological Energy (SPEE-BG)
Centre for Research and Technology Hellas - Hellenic Institute of Transport – GR (CERTH-HIT)
Bulgarian Electric Vehicles Association – BG (BAEPS)

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INTRODUCTION

This report outlines the process and considerations involved in creating a platform and mobile application dedicated to displaying electric vehicle (EV) charging stations on a map. The objective of this assignment is to provide EV owners with a user-friendly tool for locating nearby charging stations, obtaining real-time information, and facilitating seamless navigation to these stations.

Technical specifications have been developed by PB3 subcontractor while the platform and app development was subcontracted by LB to the software company Alexdesign studio Ltd, supported by two LB inhouse to IT specialists, responsible for data management and Quality Assurance.

PB2 (CERTH) had supported the development by giving feedback on the mapping, on the details of the charging stations that were included in the list, as well as, additional technical specifications where were needed.

Moreover, CERTH had reviewed the front-end of the application in order to provide some feedback regarding how the user could have a friendlier environment to navigate.

I. RATIONALE

As the popularity of electric vehicles continues to grow, the need for easily accessible charging infrastructure becomes paramount. Efficiently locating charging stations and accessing relevant information, such as availability and compatibility, is crucial for EV drivers. By creating a dedicated platform and mobile application, we can simplify this process and contribute to the widespread adoption of electric vehicles.

II. TECHNICAL SPECIFICATIONS (PB3)

The platform and mobile application should feature a visually appealing and intuitive user interface (UI) design. The map should display charging stations clearly, allowing users to easily identify their locations, charging capacities, and available connector types. The UI should prioritize ease of use, providing intuitive search and filtering options to cater to different user preferences.

Integrating geolocation services into the mobile application enables users to identify nearby charging stations automatically. Seamless navigation features should be implemented to guide users to their selected charging station efficiently. Integration with popular navigation apps, such as Google Maps or Waze, enhances the user experience and promotes seamless transition between platforms.

Future enhancement: To enhance user experience, real-time data integration is essential. By partnering with charging network operators and utilizing APIs (Application Programming Interfaces), the platform can display accurate and up-to-date information on charging station availability, pricing, and operational status. Regular data synchronization ensures users have reliable and current information at their fingertips.

The following specifications were agreed to be developed in the framework of the project:

A platform should be developed to manage and visualize charging station locations with their details on a map on mobile devices. It should consist of the following components:

- Database: contains the job created by the customer
- API – programming interface providing connection between different components
- Back-office – control panel with an interface for editing/managing information in the system.
- Mobile applications – Google Android, Harmony OS, Apple iOS to provide information to end users

The technologies on which it is based are as follows:

- Database – MySQL / MariaDB
- API – PHP/Laravel
- Back office – HTML /JavaScript + Vue.js
- Mobile Apps – Java for Android/Harmony OS, Swift for iOS

Functionalities by components: The database and API provide the relevant functionality for the other components of the system to work. UI components must have the following functionality:

1. Back office

Management of locations/facilities

- Create and edit an object with the following attributes
- location
- title, description/free text
- populated place
- operator
- number of stations
- type of stations
- charging prices
- method of payment
- pictures
- additional information for each object
- status
- visibility in applications
- multilingual option

Notifications: ability to send push notifications to all app users, both when adding an object and freely

Static Content: ability to edit static content in the applications - about the project, privacy policy, contact information

Review Application Feedback: An interface listing and detailing feedback messages sent by applications

Nomenclature

- Language management and editing

- Management and editing of operators
- Country management and editing
- Other parameters suitable for object grouping

Controlled Access

- The panel must have limited access, with a user/email and password
- Possibility of access levels or resource rights

Logs: Every action of the administrators in the system should be recorded for the purpose of traceability in case of malicious actions

2. Mobile applications - description of functionality by screens

Home Screen - Map Links, Project Information, Privacy Policy, Contact/About App

Map

- visualization of objects/locations on a map with the possibility of interaction;
- use of user/device location
- clicking on a location on the map leads to a detail about the object
- possibility to filter objects according to different criteria – operator, country, status, charging type, payment method, distance from the user.
- Calculating the distance of the selected from the user's location
- Search by keyword

List of objects

- List view with name, photo and city
- Ability to search by keyword
- Ability to sort by criteria
- Ability to filter objects
- A reference to an object detail

Detail for selected object

- Visualization of the information entered by the Back office.
- Reference to navigation to the object
- Reference to operator application
- Feedback form

Project Information: Only visible on map without filter

Settings

- Change language
- Enable/disable notifications
- Link to 'about app' screen

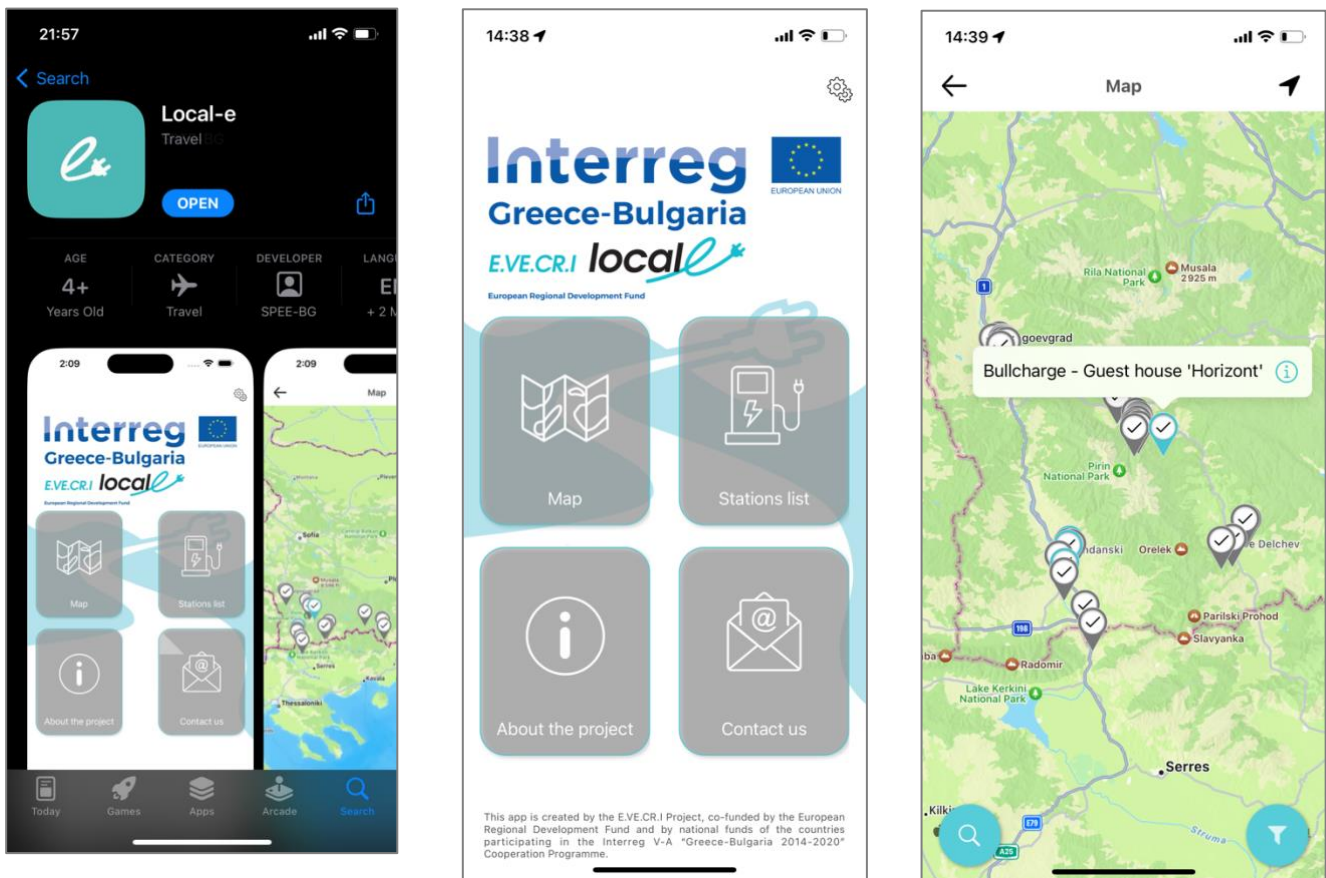
Contacts

- View contact details
- Contact form

About the application: Copyright information

III. INTEROPRABILITY PLATFORM AND MOBILE APPLICATIONS (PB1)

Visual Design Elements: The user interface (UI) design aimed to create a visually appealing and intuitive platform that promotes a seamless user experience. The design focused on simplicity, clarity, and consistency across different screens and functionalities. User-centered design principles guided the placement of key features and information to optimize usability. The visual design elements of the platform were carefully considered to enhance the user experience. A consistent color scheme, typography, and iconography were employed to ensure visual coherence. Attention was given to creating clear and easily readable text, appropriate contrast ratios, and intuitive iconography that aligns with industry standards.



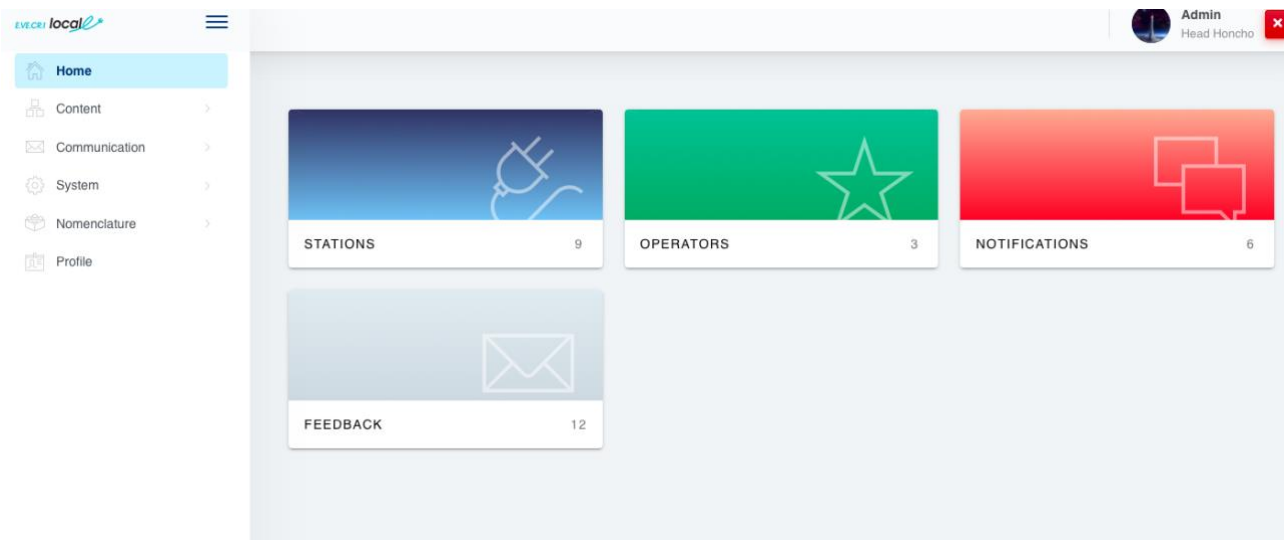
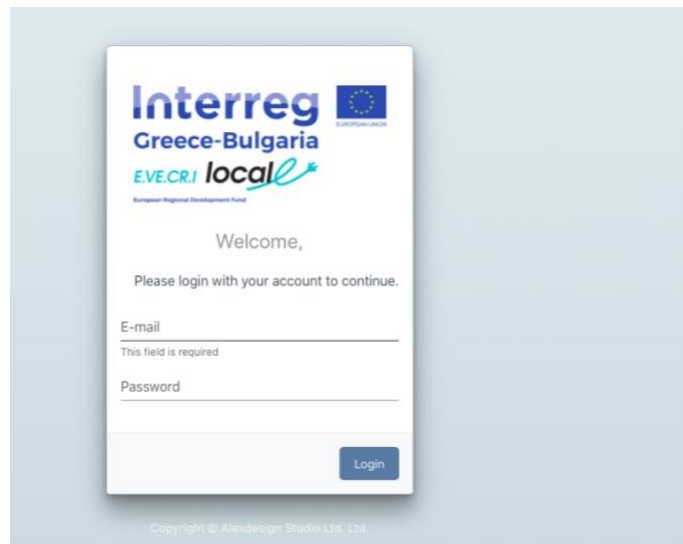
Accessibility Considerations: The accessibility of the cross-border EV charging platform was a priority during the design process. The platform adhered to WCAG (Web Content Accessibility Guidelines) standards to ensure inclusivity and usability for individuals with disabilities. Accessibility features such

as adjustable font sizes, color contrast options, and screen reader compatibility were implemented to cater to diverse user needs.

Backend Development: The platform's backend development focuses on managing the charging station database and handling user queries and requests. The backend supports efficient data retrieval, storage, and update operations. APIs allow the mobile application to communicate with the platform and retrieve necessary information.

Charging Station Database Management

Maintaining an up-to-date and comprehensive charging station database is crucial for accurate mapping. Collaborating with charging network operators and utilizing open data sources can help ensure the database is comprehensive and regularly updated. Implementing database management protocols and automated data synchronization processes minimize data inconsistencies and ensure data integrity. The admin panel is illustrated below:

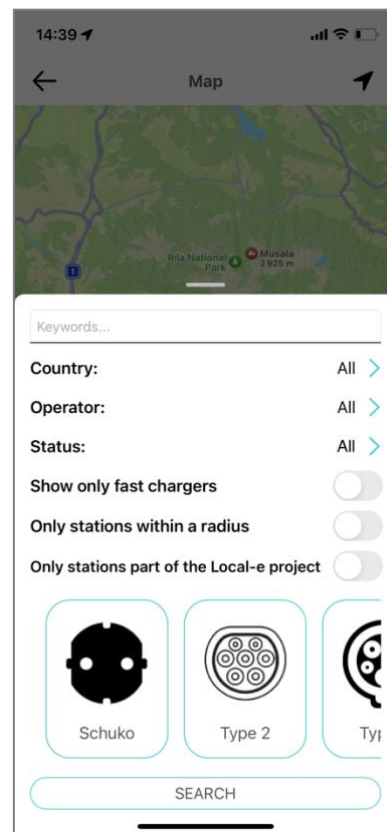
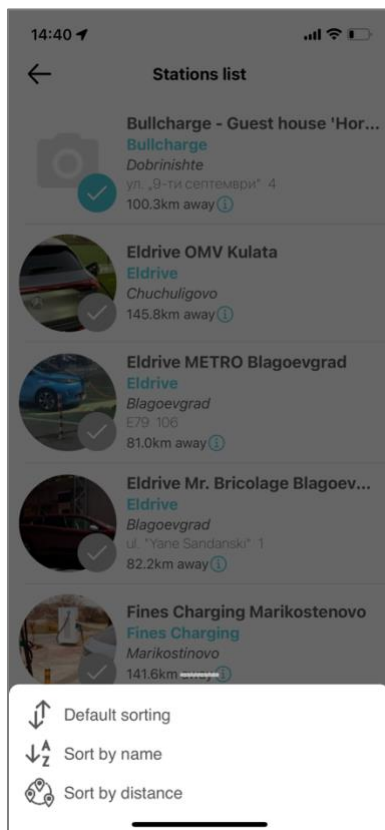




User Features and Functionality

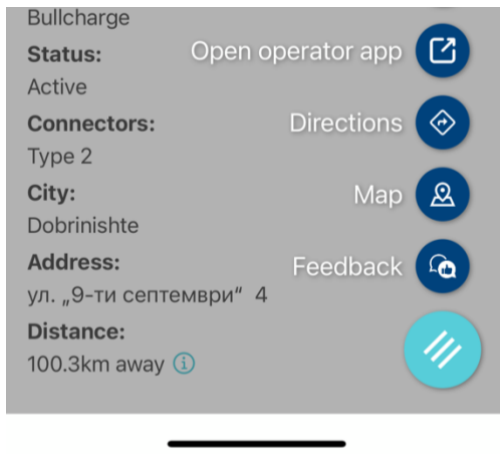
Search and Filtering Options

The mobile application offers search and filtering functionalities to allow users to find charging stations based on their specific requirements. Users are able to filter by charging speed, connector type, availability of fast charging options, and other relevant parameters. Additionally, advanced search options such as filtering by payment methods or network providers can enhance the user experience.



User Reviews and Ratings

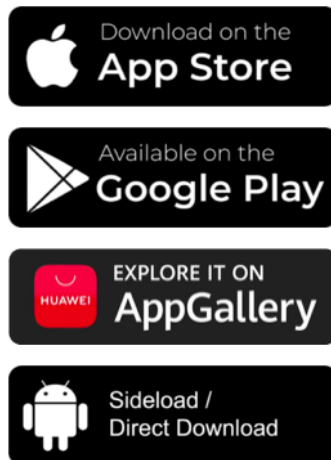
Integrating user reviews and ratings into the platform and mobile application adds a valuable layer of information for EV drivers. Users can provide feedback on their charging experiences, including station reliability, amenities, and user-friendliness. Displaying these reviews and ratings helps users make informed decisions and fosters a sense of community and trust among EV owners.



App download on iOS, Android and Huawei:

The application is available through the app-store off mobile phones, or via the project website on <https://local-e.eu/interoperability-platform/>

You can download the app from the following links:



CONCLUSION AND RECOMMENDATIONS FOR FUTURE DEVELOPMENT OF THE PLATFORM

Creating a platform and mobile application for displaying EV charging stations on a map addresses a crucial need in the EV ecosystem. By focusing on user-friendly design, real-time data integration, robust backend development, and comprehensive user features, this solution empowers EV drivers to locate and access charging infrastructure effortlessly. Through careful testing, successful launch, and continuous improvement, the platform and mobile application can contribute to the seamless adoption and growth of electric vehicles.

The development process should not end with the initial launch. Continuous improvement and regular feature enhancements based on user feedback, market trends, and emerging technologies are vital for maintaining relevance and providing a competitive edge. Monitoring user engagement, conducting periodic updates, and actively seeking user feedback ensure the platform remains effective and evolves with the changing needs of EV drivers.

To further enhance the platform's capabilities and real-time data integration, the following recommendations are proposed:

- **Expand Charging Station Database:** Continue expanding and updating the charging station database by collaborating with charging network operators, local authorities, and other relevant stakeholders. Regularly review and verify the accuracy of the data to ensure the platform provides comprehensive and up-to-date information for users. Explore partnerships with data providers or open data initiatives to access additional charging station data sources.
- **Integration with Charging Networks:** Strengthen integration with charging networks to enable seamless real-time data retrieval and display. Establish partnerships with major charging network operators to access their APIs or data feeds, allowing for instant updates on charging station availability, status, and pricing. Implement data synchronization mechanisms to ensure that the platform reflects the most current information from the charging networks.
- **Dynamic Pricing Information:** Consider integrating dynamic pricing information into the platform to provide users with real-time pricing details for charging sessions. Collaborate with charging network operators to access pricing data and implement features that display the cost of charging at specific stations based on factors such as time of day, charging speed, and network membership. This will empower users to make informed decisions based on pricing transparency.
- **Charging Station Reservation:** Implement a reservation system that allows users to reserve charging stations in advance. Real-time data integration can facilitate this feature by providing live updates on station availability and allowing users to secure a charging spot for a specific time period. Integration with payment systems can enable users to pay for reservations securely through the platform.
- **Integration with EV Navigation Systems:** Explore partnerships with EV navigation system providers to integrate the platform's charging station data. By connecting with popular EV navigation apps, users can seamlessly access charging station information while planning their routes. Integration can allow for real-time updates on station availability and guide users to the nearest and most suitable charging stations along their journeys.

- **User-generated Content and Community Features:** Enhance the platform's community engagement by incorporating user-generated content and community features. Enable users to contribute reviews, ratings, and photos of charging stations, sharing their experiences with the community. Implement features such as forums or social media integration to foster a sense of community among EV drivers, encouraging knowledge sharing and support.
- **Machine Learning and Predictive Analytics:** Leverage machine learning and predictive analytics to enhance the platform's capabilities. By analyzing historical data on charging station usage patterns, the platform can provide intelligent recommendations for users, suggesting optimal charging stations based on their preferences, travel history, and real-time availability. Predictive analytics can also help identify potential congestion or high-demand periods at charging stations, allowing users to plan their charging sessions more efficiently.
- **Accessibility and Multilingual Support:** Continue improving accessibility features to ensure the platform caters to users with diverse accessibility needs. Consider implementing features such as screen reader compatibility, text resizing options, and color contrast adjustments. Additionally, support multiple languages to cater to users in various regions, facilitating wider adoption and usability for non-native language speakers.

In conclusion, future development and real-time data integration should focus on expanding the charging station database, strengthening integration with charging networks, implementing dynamic pricing information, enabling charging station reservations, integrating with EV navigation systems, fostering user-generated content and community features, leveraging machine learning and predictive analytics, and enhancing accessibility and multilingual support. These recommendations aim to provide an enhanced user experience, improved functionality, and increased value for EV drivers, further contributing to the growth and adoption of electric vehicles.