Go Go Car

Statements of needs

« Mi Carro Es Tu Carro » Project

Statements of needs

Project Title	Mi Carro Es Tu Carro

Project Ref.	GGC

References	REQ-GGC-EMB-M1-2022-23-001

Historical

Version	Authors	Description	Date
-	GDe - LGi		08/08/2022

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1. Acronyms

PDR : Preliminary Design Review
CDR : Critical Design Review
RPM : Round Per Minutes
EU : European Union
CE : Conformité Européenne
WP : Work Package
POC : Proof Of Concept
PCB : Printed Circuit Board
ECU : Electronic Control Unit
HMI : Human Machine Interface

2. Project overview

The startup "Go Go Car" wants to set up a personal vehicle loan service between individuals. The co-founders want to validate some technological bricks before launching a first phase of fundraising.

The 2 co-founders decided to entrust the students of the "Embedded System" option with the project. The goal is to provide a TRL 7 level model.

3. Statement of needs

The loan service will be based on a smartphone application that will allow users to make their vehicles available and to book the vehicles of other users. Each vehicle will be equipped with a box to control the start of the vehicle and track driver behavior in real time and record the number of kilometers traveled, engine RPM and speed for example.

The need is to design:

- a system embedded in a vehicle which makes it possible to retrieve information on speed, acceleration, fuel level and any other parameter deemed interesting and to block/unblock the starting of the vehicle
- an identification system for the user authorized to borrow the vehicle in the near field and via a smartphone
- an application for vehicle provision, reservation, and user management

The project will be focused mainly on the hardware and communication aspects. The smartphone application can be in a limited version in case of lack of time.

4. Statement of requirements

1.1. Technical requirements

The solution will be based on off-the-shelf protocols and technologies. No proprietary solution will be allowed. Cyber security concerns will have to be addressed.
The solution should be based on a STM32 microcontroller.
The board will be powered by the car with no external cable or power supply.

1.2. User requirements

The system must be developed on an Android platform and must be user-friendly.

1.3. Legal requirements

The solution must be compliant with laws and rules of the EU zone (for example CE labeling).

1.4. Financial requirements

The overall design and development budget will be less than **1000€**.

1.5. Market requirements

The final casing will be the smallest as possible. The hardware solution target price will be the most competitive possible to target the market.

1.6. Project requirements

The team will be managed by a general project manager and work package leaders.

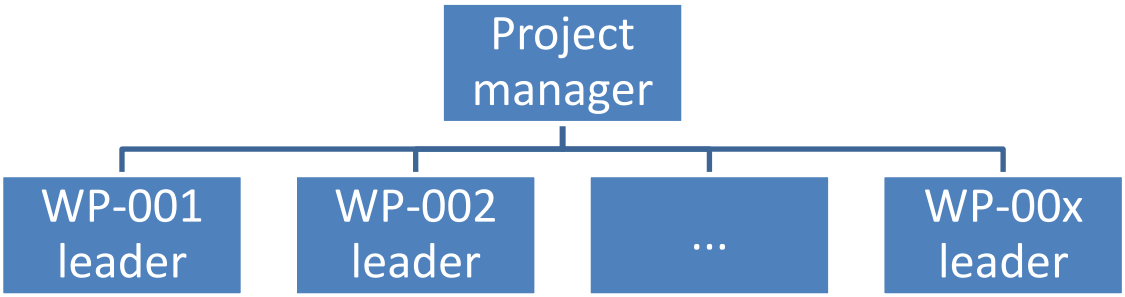

Figure 1 : Project organization

5. Work packages

The project will be divided in several work package. Each work package will have a team leader and will be responsible of the reporting and the deliverables.

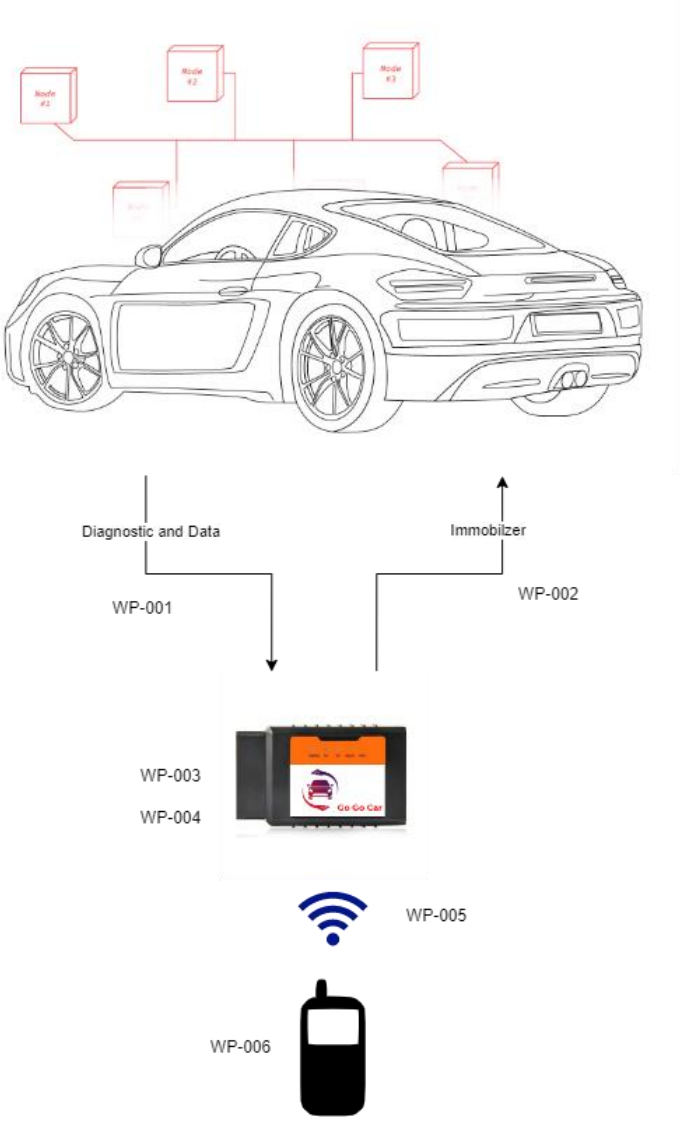

Figure 2 : Overall project organization

Work packages will be the following:

- WP-001 – In-vehicle data collection
- WP-002 – Car immobilizer system
- WP-003 – Tracker (hadware)
- WP-004 – User experience
- WP-005 – Wireless communications
- WP-006 – Project Management

1.1. WP-001 – In-vehicle data collection

Work package objectives
The objectives are to communicate with the ECU of the car to retrieve parameters such as RPM, speed, fuel level and any others interested parameters.
Description of activities
• State of the art • Prototyping • Coding • Testing • Integration
Timetable with milestones
• POC on December • Final release on May
Outputs and deliverables
C/C++ embedded software fully documented
Relationship to other work packages
WP-003, WP-002, WP-006

1.2. WP-002 – Car immobilizer system

Work package objectives
The objectives are to code a way to prevent the car to start. User must unlock the system using a near field communication from his smartphone according to the rights management given by the application.
Description of activities
• State of the art • Prototyping • Hardware development and/or Coding • Testing • Integration
Timetable with milestones
• POC on December • Final release on May
Outputs and deliverables
External solution or WP-003 depending solution based on C++ embedded software fully documented
Relationship to other work packages
WP-003, WP-001, WP-005, WP-006

1.3. WP-003 – Tracker (hadware)

Work package objectives
The objectives are to design a board able to communicate with the car data bus. This design will host the data collection, the car immobilizer system, the near field system used to unlock the car and the other wireless communication to the smartphone. The board will be self-powered.
Description of activities
• State of the art • Prototyping • Designing • Placing and routing • PCB provisioning • Soldering • Test
Timetable with milestones
• PDR on October • CDR on December • PCB on beginning of April • Final board on May
Outputs and deliverables
Electronics board with technical development documentation to be plugged in a car
Relationship to other work packages
All WP

1.4. WP-004 – User experience

Work package objectives
The objective of this WP is to ensure a great user experience using our solution. This WP will be responsible of the board casing and the Android smartphone application.
Description of activities
• Mock-up • User stories • Prototype • Integration with other WP • Printing/Manufacturing and coding (Access rights based on a history of use, backup of route data, HMI).
Timetable with milestones
• User stories on October • Mock-up on December • Casing prototype on March • Final release on May
Outputs and deliverables
• Case with technical development documentation • Android Software development
Relationship to other work packages
WP-001, WP-002, WP-003, WP-005, WP-006

1.5. WP-005 – Wireless communications

Work package objectives
The objective of this WP is to design and code all wireless communication protocol in use on the product, ie: near field for immobilizer and data exchange with the smartphone.
Description of activities
• State of the art • Choice of technologies to be used (pros and cons) • Implementation and coding • Integration with other WP • Tests
Timetable with milestones
• POC on December (first prototype) • Final release on May
Outputs and deliverables
• Hardware solution to be embedded on WP-003 • C++ embedded software fully documented • Design and manufacturing of antenna
Relationship to other work packages
WP-003, WP-004, WP-006

1.6. WP-006 – Project Management

Work package objectives
Ensure the organization and monitoring of the progress of the project.
Description of activities
• Project management • Team cohesion • Customer relationship
Timetable with milestones
• Establishment of a hierarchy with working project leaders end of October 2022 • CDR on February or march • Final release on May with operational demonstration of the complete system with the ISEN vehicle
Outputs and deliverables
• Bi-monthly short reporting and CDR with WP leaders and customer • Full Documentation
Relationship to other work packages
All WP