# **Faculty of Engineering & Technology, Department of Computing**

# **Project Proposal Form**

**Name Ricardo Filipe Duarte Barrao Student No: L00188362** **Date: 06/03/2025**

**Proposed working title of project:**

On Demand Car Sharing System

**1.** **Why have you chosen your particular project?**

|  |
| --- |
| On a today’s world almost everything is interconnected, today we’re presented with many on demand sharing services such as e-bikes or scooters, but cars are yet a niche today.  The idea of this project is to design and implement a solution (as proof of concept) that implements a V2X (Vehicle 2 Everything) solution that allows a user to easily pick up a car given its availability with the focus being on a generic application of the solution on an overall perspective and to showcase a few emerging technologies and trends in the world of automotive. |

**2.** Please include a 300/400 word draft of your proposed project here. Indicate **clearly** what your practical artefact is going to be.

|  |
| --- |
| Based on Navit’s report (navit.com, 2024), today the number of car sharing services in Germany increased 27% in early 2024 compared to the same period in the year before which manifests the increase of service, which could be evidence of an increase in search for such solution as part of emphasis to solve urban mobility. This values are even more impactful on a global scale, according to Katarzyna Turoń articles (Turo, 2023), currently around 55% of the world population lives in urban centres, and currently car sharing is serviced by 236 operators in 59 different countries, which highlights the necessity of such service to improve in urban mobility.  The project will aim to design and implement a solution that provides a generic proof of concept service for on demand car sharing service. The main areas targeted area is IoT (smart mobility) with indirect impact in cybersecurity.  The solution is divided in three major components:   * A server that receives and processes data * A car onboard application (only a demo binary running locally) which communicates current state and session with server * A user application that renders the available cars (by fetching the car data in each area from the server), requests a session to a specific car and authenticates via JWT token   This aims to emulate a vehicle to everything solution that connects cars to the cloud and to people over personal devices.  In order to implement the components above mentioned both the server and client application are desired to be implemented using Kotlin programming language which provides KTOR as an excellent framework for https (client and server-side implementation) and Kotlin Multiplatform Compose which allows to use one code base for different platforms either by having only shared models and native UI or both models and views shared among different platforms. For the car applications the idea is to create a simple binary that sends data and receives data through the server and emulates an on-board vehicle application, which would be implemented in either Rust or C++ (which is a preferred language in embedded automotive software).  For authentication between user and car the project will aim to use a JWT token as session validator which signature can only be verified by the owners of an RSA key pair (asymmetric), which aims for a password less approach for user session validation.  A success for this project is to have an MVP implemented for all of the components and demonstratable by running the entire system (either on a local network or a docker network to emulate a real case deployment) and successfully evidence a user being able to detect available, successfully request a session token to the server, and be able to connect a session with the car, the car binary should provide an interface to the user on session established that allows the user to unlock and lock the car (by displaying a console line message in the car binary) on user request. |

**3.** Provide a tentative plan for completion of the project (date/milestones etc.), outlining the progress you would hope to make from week beginning 07/03/2025 – 26/05/2025

|  |
| --- |
| 07/03/2025 - Deliver of project proposal  18/03/2025 - Results on project proposal  07/04/2025 - Deliver of system architecture, high level design, BDD board and initial tasks  06/05/2025 - Deliverable of initial MVP based on:   * Initial app with https client code implementation * Minimal binary emulating on board with https client code and JWT verification through signature validation * Server-side code with JWT production and signature.   12/05/2025 - Fully Implemented server-side code, rendered car positions on client app, and further on-board capabilities (lock/unlock).  19/05/2025 - Code optimization, robustness, bug fixing and E2E testing.  26/05/2025 – Deliver of report, video demo, prebuilt binaries and source code (both zip and repository links) and any additional documents/artefacts |

Please upload completed forms to the ‘proposed projects’ link on the Blackboard VLE

# References

navit.com. (2024). *Carsharing 2024: Providers Compared. [online]* . Retrieved from Navit.com.: https://www.navit.com/resources/carsharing-2024-providers-compared.

Turo, K. (2023). Factors Affecting Car-Sharing Services. *Smart Cities*, 17.