**A.Y. 2023-2024 Software Engineering for HPC
Requirement Engineering and Design Project:
goal, schedule, and rules
*READ THIS VERY CAREFULLY
NO EXCUSE FOR IGNORING WHAT WE WRITE HERE***

Goal and approach

The objective of this project is to apply in practice what you have learnt during the first part of the course about requirement engineering and design.

The exercise consists in analysing the problem presented in the following section and in writing a document (in Section 5 we provide some suggestions on the structure of this document) including the following elements:

- **Requirement analysis aspects**: Derive from the goals in the problem description the use cases, requirements (both functional and non-functional), and domain assumptions. For brevity, you do not need to describe in detail each individual use case. One or more use case diagrams and the detailed description of the use case you feel is the most critical/important will be enough. Don't forget to take into account all relevant actors in the considered domain. Remember that actors are not only human beings, but all relevant devices/legacy software that interact with your system and play a role in some use case.
- **Architectural design**: Define the architecture for your system. Use component diagrams and sequence diagrams to present the architecture. Describe the purpose of each component. Highlight in the sequence diagrams how components interact with each other. Discuss about the criticalities behind your system and how you plan to address them.

Steps and deadlines

- Group registration: fill in the form https://forms.office.com/e/EPFufqM4pi. Deadline: **03/04/2024**
- Document submission: upload your document here https://webeep.polimi.it/mod/assign/view.php?id=190943. Deadline: **17/04/2024**
- Feedback by instructors due by **10/05/2024**

Rules

- Groups can be composed of three or four students each. If a student, for any reason, is aware of not being able to coordinate with others and, therefore, be part of a group, can take the project as an individual. This, however, should be considered as the last resort as the work of a software engineer is inherently collaborative and takes advantage from the discussion with multiple stakeholders.

- You must provide the requirement and design document within the stated deadline. A delay of a few days, if notified in advance to the reference professor, will be tolerated, but it will also result in a penalty in the final score.
- The maximum score for this assignment is 8 points. The assessment will be based on the accuracy, consistency, and completeness of the requirement and design parts.

The problem

Two urgent global concerns are environmental sustainability and climate change; because of air pollution and greenhouse gas emissions, transportation—especially urban commuting—contributes to worsening those issues.

Even today, urban areas are characterized by a heavy reliance on personal vehicles, which are seen as the most comfortable and efficient way of commuting, despite several studies showing that better alternatives exist in most cases.

Improving public transportation systems' efficiency can make them more appealing to daily commuters and is, therefore, a promising way to lessen environmental impact and, at the same time, to increase the overall quality of citizens' life (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0223650).

The project "Eco-City Commute" (ECC) aims to create a comprehensive software system that makes public transportation within an urban area as easy and efficient as possible, promoting its adoption.

ECC receives data from sensors, deployed on public transport means, that provide information about their respective occupancy rates. Moreover, it can acquire real-time information about public transit timetables, as well as information about bike and ride-sharing, from specific services (think at ATM in Milano, bikemi, mobike, blablacar, ...).

Based on these pieces of information, ECC offers services to two types of stakeholders:

- **Citizens**: ECC offers a mobile app that allows citizens to input the origin and the destination of their trips within the urban area, together with any constraint they have (e.g., they do not want to use a bike, or they must arrive at destination within a certain timeframe). The app will compute for them environmentally friendly routes, possibly combining different transportation means.
- **Urban area managers**: ECC offers to managers a dashboard through which they can visualize reports concerning the daily usage of the various available transportation means, their occupation rates and delays (if any).

Assignment for groups composed of three students and for individuals: please focus your requirement analysis and design work on the features dedicated to one of the two types of stakeholders mentioned above of your choice.

Assignment for groups composed of four students: please focus your requirement analysis and design work on the features dedicated to both types of stakeholders.

The document to be created

The document you produce will include at least the following elements. You can extend this structure if you think it is needed:

- **A front page** that includes the project title (it is up to each group to invent a name for it), the version of the document, your names and the release date.
- **A table of contents** that includes the headers of the first three levels of headings in your document, with the corresponding page number.
- **Section 1.** The project and project goals. You can copy and freely re-elaborate (if needed) the description you find in this document.
- **Section 2**. Requirement analysis. It will include:
  - 2.1. Relevant human and non-human actors
  - 2.2. Use cases
  - 2.3. Domain assumptions
  - 2.4. Requirements
    - 2.4.1. Functional requirements
    - 2.4.2. Non-functional requirements
- **Section 3**. Design. It will include:
  - 3.1. General description of the architecture. It will include a component diagram and a description of components.
  - 3.2. Sequence diagrams. Include here at least three sequence diagrams that describe the most relevant interactions in the system.
  - 3.3. Critical points and design decisions.