# Product description

Our project consists in three main parts which are communication, formation of platooning and driving. For each of them we have planned some simulation.

Some communications scenarios that might be simulated.

* Trucks can share information for their location and real time positions.
* Trucks can share information for general street conditions especially in difficult weather conditions.
* Trucks can share information for an emergency cause by external factors in a specific part of the street (Working cantier, Infrastructure damage etc.)
* Trucks can share information for their directions and trajectory so the driving manoeuvres can be done smoother.

List of processes that might be simulated in platooning.

* Trucks can join the platooning as a follower as well as a leader.
* At a specific point in time a truck might need to leave the platooning.
* The leader selection which is done by using a specific election algorithm.

List of processes that might be simulated in driving domain.

* A brake simulation is performed when a user through the main controller gives this command.
* A accelerate simulation is performed when a user through the main controller gives this command.
* A full stop simulation is performed when a user through the main controller gives this command.

# Technologies

* Programming languages
* All microservices will be programmed in C++ 11 or later versions.
* Local server side and querying will be programmed with Node-JS.
* In a dynamic web page we might use HTML, Js, CSS, Bootstrap.

# Use-Cases

**Communication**

In the communication use case is demonstrated how the trucks can share different information based on their needs. One case might be turning information in this case they can perform V2V communication with on board communication system if they are in range. If the trucks are not in range, they still can communicate but this time through a cloud-based control unit. And in this case, we make sure that communication is established, and it is stable in our system.

Diagram

Description automatically generated

# Diagram Description automatically generatedStructure of the software

The main components in driving controller that might be simulated are motion data and collision. Motion has three main sub-classes which are braking/stopping, Turning left/right and acceleration. Each sub-class has its own attributes. The second class is Collision which has two sub-classes. The sub-classes are collision warning and collision avoiding. Each sub-class has its own attributes as well.

# Communication flow

**V2V Sequence Diagram-Data share**

**Diagram

Description automatically generated**Based in the use case we developed two different sequence diagrams. In this case the communication is done through on-board communication system that each truck has. Truck B collect some information regarding a specific scenario (Speed, obstacles, Road signs, Position). This information is forwarded to on board control unit of the truck B. The information is processed and verified in the control unit. After this step the control unit can broadcast this information to Truck A.in the next step the truck A send a confirmation to control unit if the information was received successfully.

Diagram, box and whisker chart

Description automatically generated

In the second sequence diagram the communication is done through a cloud based main control unit. In this case the truck sends information to the SW agent maybe an update in location or speed or another type of information. In the next step the SW agent deliver this information to the main control unit. The web-based control unit can now distribute the information to different trucks if they need this type of information. After the control unit receive the information it sends back to the truck a notification that the information was received successfully.